STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

STANDARD LOW BID PROJECT

September 7, 2006

BUILDING 1190 REMODEL
CAMP WILLIAMS

UTAH NATIONAL GUARD
RIVERTON, UTAH

DFCM Project Number 06012480

L.K. Sorensen Associates, Inc.
3448 South Main Street
Salt Lake City, Utah 84115

TABLE OF CONTENTS

Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at http://dfcm.utah.gov or are available upon request from DFCM.

DFCM General Conditions dated May 25, 2005.
DFCM Application and Certification for Payment dated May 25, 2005.

Technical Specifications :
Drawings:

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at http://dfcm.utah.gov

NOTICE TO CONTRACTORS

Sealed bids will be received by the Division of Facilities Construction and Management (DFCM) for:

BUILDING 1190 REMODEL - CAMP WILLIAMS
UTAH NATIONAL GUARD - RIVERTON
DFCM PROJECT NO: 06012480

Bids will be in accordance with the Contract Documents that will be available at 12:00 NOON on Thursday, September 7, 2006 and distributed in electronic format only on CDs from DFCM, 4110 State Office Building, SLC, Utah and on the DFCM web page at http://dfcm.utah.gov. For questions regarding this project, please contact Wayne Smith, DFCM, at 801-550-6536. No others are to be contacted regarding this bidding process. The construction budget for this project is $485,000.

A **mandatory** pre-bid meeting will be held at 10:30 AM on Tuesday, September 12, 2006 at Building 119, Camp Williams, 17800 South Redwood Road, Riverton, Utah. All bidders wishing to bid on this project are required to attend this meeting.

Bids will be received until the hour of 3:00 PM on Tueseday, September 19, 2006 at DFCM, 4ll0 State Office Building, Salt Lake City, Utah 84114. Bids will be opened and read aloud in the DFCM Conference Room, 4110 State Office Building, Salt Lake City, Utah. NOTE: Bids must be received at 4110 State Office Building by the specified time.

Bid security, in the amount of five percent (5%) of the bid, must be submitted as stated in the Instruction to Bidders.

The Division of Facilities Construction and Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of DFCM.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
Marla Workman, Contract Coordinator
4110 State Office Building, Salt Lake City, Utah 84114

PROJECT DESCRIPTION

This project consists of interior remodel of an existing building to create maintenance shop space for the Post. In addition to a wood shop, paint shop, and plumbing shop, there will be some storage space, office space and restrooms included.

Contractors who wish to bid this project must be pre-qualified by providing a five year work history of successfully completed projects which are similar in scope to DFCM prior to the mandatory pre-bid meeting **UNLESS** the contractor has successfully completed State construction contracts within the last five years. Direct pre-qualification statements along with a short management plan of how the project will be scheduled and managed to Wayne Smith, DFCM, e-mail wfsmith@utah.gov or fax 801-538-3267.

PROJECT SCHEDULE

PROJECT NAME: **BUILDING 1190 REMODEL - CAMP WILLIAMS UTAH NATIONAL GUARD – RIVERTON, UTAH**

DFCM PROJECT NO.: **06012480**

Event	Day	Date	Time	Place
Bidding Documents Available	Thursday	September 7, 2006	12:00 NOON	DFCM 4110 State Office Bldg SLC, UT or DFCM web site *
Mandatory Pre-bid Site Meeting	Tuesday	September 12, 2006	10:30 AM	Building 119 Camp Williams 17800 So Redwood Rd Riverton, UT
Last Day to Submit Questions	Thursday	September 14, 2006	4:00 PM	DFCM 4110 State Office Bldg SLC, UT
Final Addendum Issued	Friday	September 15, 2006	4:00 PM	DFCM web site *
Prime Contractors Turn In Bid and Bid Bond / Bid Opening in DFCM Conference Room	Tuesday	September 19, 2006	3:00 PM	DFCM 4110 State Office Bldg SLC, UT
Sub-contractor List Due	Wednesday	September 20, 2006	3:00 PM	DFCM 4110 State Office Bldg SLC, UT
Project Completion	Wednesday	January 31, 2007		

*** DFCM's web site address is http://dfcm.utah.gov**

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **BUILDING 1190 REMODEL – CAMP WILLIAMS – UTAH NATIONAL GUARD – RIVERTON, UTAH – DFCM PROJECT NO. 06012480** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

BASE BID: For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

ADDITIVE ALTERNATE #1: Air Compressor Building

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

ADDITIVE ALTERNATE #2: Dust Collection System

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

ADDITIVE ALTERNATE #3: Compressed Air System

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

ADDITIVE ALTERNATE #4: Existing Windows Replacement

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

ADDITIVE ALTERNATE #5: Paint Booth

_____ DOLLARS ($_____)
(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete no later than **January 31, 2007,** should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **$ 375.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable l00% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization: _____ (Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws: _____

Respectfully submitted,

_____
Name of Bidder

_____
Authorized Signature

ADDRESS:

_____

_____

INSTRUCTIONS TO BIDDERS

1. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Invitation to Bid.

2. Bids

Before submitting a bid, each contractor shall carefully examine the Contract Documents, shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Invitation to Bid prior to the deadline for submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.

If the bid bond security is submitted on a bid bond form other than DFCM's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. NOTE: A cashier's check cannot be used as a substitute for a bid bond.

3. Contract and Bond

The Contractor's Agreement will be in the form bound in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the contract sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for subcontractors will be specified in the Supplementary General Conditions.

4. Listing of Subcontractors

Listing of Subcontractors shall be as summarized in the "Instructions and Subcontractor's List Form", which are included as part of these Contract Documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contracts for a period of up to three years.

5. Interpretation of Drawings and Specifications

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Project Manager a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addenda posted on DFCM's web site at http://dfcm.utah.gov. Neither the DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

6. Addenda

Addenda will be posted on DFCM's web site at http://dfcm.utah.gov. Contractors are responsible for obtaining information contained in each addendum from the web site. Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding.

7. Award of Contract

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

8. DFCM Contractor Performance Rating

As a contractor completes each DFCM project, DFCM, the architect/engineer and the using agency will evaluate project performance based on the enclosed "DFCM Contractor Performance Rating" form. The ratings issued on this project will not affect this project but may affect the award on future projects.

9. Licensure

The Contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

10. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

11. Time is of the Essence

Time is of the essence in regard to all the requirements of the Contract Documents.

12. Withdrawal of Bids

Bids may be withdrawn on written request received from bidder prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

13. Product Approvals

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

14. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the contractor, subcontractor or sub-subcontractor.

15. Debarment

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by DFCM as part of the requirements for award of the Project.

BID BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of $_____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____ .

Principal's name and address (if other than a corporation):

_____

_____

By: _____

Title: _____

Principal's name and address (if a corporation):

_____

_____

By: _____

Title: _____

(Affix Corporate Seal)

Surety's name and address:

_____

_____

STATE OF _____)
) ss.
COUNTY OF _____)

By: _____
Attorney-in-Fact (Affix Corporate Seal)

On this ____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My Commission Expires: _____
Resides at: _____

_____
NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, on the following basis:

PROJECTS UNDER $500,000 - ALL SUBS $20,000 OR OVER MUST BE LISTED
PROJECTS $500,000 OR MORE - ALL SUBS $35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- Bidder must list "Self" if performing work itself.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

BIDDER LISTING 'SELF' AS PERFORMING THE WORK:

Any bidder that is properly licensed for the particular work and intends to perform that work itself in lieu of a subcontractor that would otherwise be required to be on the subcontractor list, must insert the term 'Self' for that category on the subcontractor list form. Any listing of 'Self' on the sublist form shall also include the amount allocated for that work.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A.Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

GROUNDS FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

(1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
(2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
(3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
(4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
(5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
(6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #
ELECTRICAL	ABCD Electric Inc.	$350,000.00	123456789000
LANDSCAPING	"Self"	300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: 350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.

SUBCONTRACTORS LIST

FAX TO 801-538-3677

PROJECT TITLE: _____

Caution: You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____ SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR DFCMS REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY DFCM. ATTACH A SECOND PAGE IF NECESSARY.

FUGITIVE DUST PLAN

The Contractor will fill out the form and file the original with the Division of Air Quality and a copy of the form with the Division of Facilities Construction & Management, prior to the issuance of any notice to proceed.

The Contractor will be fully responsible for compliance with the Fugitive Dust Control Plan, including the adequacy of the plan, any damages, fines, liability, and penalty or other action that results from noncompliance.

Utah Division of Air Quality
April 20, 1999

GUIDANCE THAT MUST BE CONSIDERED IN DEVELOPING AND SUBMITTING A DUST CONTROL PLAN FOR COMPLIANCE WITH R307-309-3, 4, 5, 6, 7

Source Information:

1. Name of your operation (source): provide a name if the source is a construction site.

2. Address or location of your operation or construction site.

3. UTM coordinates or Longitude/Latitude of stationary emission points at your operation.

4. Lengths of the project, if temporary (time period).

5. Description of process (include all sources of dust and fugitive dust). Please, if necessary, use additional sheets of paper for this description. Be sure to mark it as an attachment.

6. Type of material processed or disturbed.

7. Amount of material processed (tons per year, tons per month, lbs./hr., and applicable units).

8. Destination of product (where will the material produced be used or transported, be specific, provide address or specific location), information needed for temporary relocation applicants.

9. Identify the individual who is responsible for the implementation and maintenance of fugitive dust control measures. List name(s), position(s) and telephone number(s).

10. List, and attach copies of any contract lease, liability agreement with other companies that may, or will, be responsible for dust control on site or on the project.

Description of Fugitive Dust Emission Activities
(Things to consider in addressing fugitive dust control strategies.)

1. Type of activities (drilling and blasting, road construction, development construction, earth moving and excavation, handling and hauling materials, cleaning and leveling, etc).

2. List type of equipment generating the fugitive dust.

3. Diagram the location of each activity or piece of equipment on site. Please attach the diagram.

4. Provide pictures or drawings of each activity. Include a drawing of the unpaved/paved road network used to move loads "on" and "off" property.

5. Vehicle miles travels on unpaved roads associated with the activity (average speed).

6. Type of dust emitted at each source (coal, cement, sand, soil, clay, dust, etc.)

7. Estimate the size of the release area at which the activity occurs (square miles). For haul or dirt roads include total miles of road in use during the activity.

Description of Fugitive Dust Emission Controls on Site

Control strategies must be designed to meet 20% opacity or less on site (a lesser opacity may be defined by Approval Order conditions or federal requirements such as NSPS), and control strategies must prevent exceeding 10% opacity from fugitive dust at the property boundary (site boundary) for compliance with R307-309-3.

1. Types of ongoing emission controls proposed for each activity, each piece of equipment, and haul roads.

2. Types of additional dust controls proposed for bare, exposed surfaces (chemical stabilization, synthetic cover, wind breaks, vegetative cover, etc).

3. Method of application of dust suppressant.

4. Frequency of application of dust suppressant.

5. Explain what triggers the use of a special control measure other than routine measures already in place, such as covered loads or measures covered by a permit condition (increase in opacity, high winds, citizen complaints, dry conditions, etc).

6. Explain in detail what control strategies/measures will be implemented off-hours, i.e., Saturdays/Sundays/Holidays, as well as 6 PM to 6 AM each day.

Description of Fugitive Dust Control Off-site

Prevent, to the maximum extent possible, deposition of materials, which may create fugitive dust on public and private paved roads in compliance with R307-309-5, 6, 7.

1. Types of emission controls initiated by your operation that are in place "off" property (application of water, covered loads, sweeping roads, vehicle cleaning, etc.).

2. Proposed remedial controls that will be initiated promptly if materials, which may create fugitive dust, are deposited on public and private paved roads.

Submit the Dust Control Plan to:

Executive Secretary
Utah Air Quality Board
POB 144820
15 North 1950 West
Salt Lake City, Utah 84114-4820

Phone: (801) 536-4000
FAX: (801) 536-4099

Fugitive Dust Control Plan Violation Report

When a source is found in violation of R307-309-3 or in violation of the Fugitive Dust Control Plan, the course must submit a report to the Executive Secretary within 15 days after receiving a Notice of Violation. The report must include the following information:

1. Name and address of dust source.

2. Time and duration of dust episode.

3. Meteorological conditions during the dust episode.

4. Total number and type of fugitive dust activities and dust producing equipment within each operation boundary. If no change has occurred from the existing dust control plan, the source should state that the activity/equipment is the same.

5. Fugitive dust activities or dust producing equipment that caused a violation of R-307-309-3 or the sources dust control plan.

6. Reasons for failing to control dust from the dust generating activity or equipment.

7. New and/or additional fugitive dust control strategies necessary to achieve compliance with R307-309-3, 4, 5, 6, or 7.

8. If it can not be demonstrated that the current approved Dust Control Plan can result in compliance with R307-309-3 through 7, the Dust Control Plan must be revised so as to demonstrate compliance with 307-309-3 through 7. Within 30 days of receiving a fugitive dust Notice of Violation, the source must submit the revised Plan to the Executive Secretary for review and approval.

Submit the Dust Control Plan to:

Executive Secretary
Utah Air Quality Board
POB 144820
15 North 1950 West
Salt Lake City, Utah 84114-4820

Phone: (801) 536-4000
FAX: (801) 536-4099

Attachments: DFCM Form FDR R-307-309, Rule 307-309

CONTRACTOR'S AGREEMENT

FOR:

_____
_____
_____

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____ _____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ _____ DOLLARS AND NO CENTS ($_____.00), which is the base bid, and which sum also includes the cost of a 100% Performance Bond and a 100%

Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete within _____ (___) calendar days after the date of the Notice to Proceed. Contractor agrees to pay liquidated damages in the amount of $_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Invitation to Bid, Instructions to Bidders/ Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the Contractor requests payment and agrees to

safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR: _____

_____
Signature Date

Title: _____

State of _____)
)
County of _____) _____
Please type/print name clearly

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

_____
Notary Public

(SEAL)

My Commission Expires _____

APPROVED AS TO AVAILABILITY OF FUNDS:

_____
David D. Williams, Jr. Date
DFCM Administrative Services Director

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT

_____
_____- Manager Date
Capital Development/Improvements

APPROVED AS TO FORM:
ATTORNEY GENERAL
May 25, 2005
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

_____
Division of Finance Date

PERFORMANCE BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee, " in the amount of _____ _____ DOLLARS ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ _____ Dollars ($_____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20_____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)

) ss.

COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

_____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

DFCM FORM 1b 081506

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. l953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____ _____, a corporation organized and existing under the laws of the State of _____authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars ($_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ _____ Dollars ($_____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, l953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

_____

PRINCIPAL:

_____

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

_____

SURETY:

_____

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____ _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

_____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

DFCM FORM 1b 081506

CHANGE ORDER #_____

CONTRACTOR:

ARCHITECT:

AGENCY OR INSTITUTION:
PROJECT NAME:
PROJECT NUMBER:
CONTRACT NUMBER:
DATE:

CONSTRUCTION CHANGE DIRECTIVE NO.	PROPOSAL REQUEST NO.	AMOUNT		DAYS	
		INCREASE	DECREASE	INCREASE	DECREASE

	Amount	Days	Date
ORIGINAL CONTRACT			
TOTAL PREVIOUS CHANGE ORDERS			
TOTAL THIS CHANGE ORDER			
ADJUSTED CONTRACT			

DFCM and Contractor agree that the terms, contract sum, scope of the Work and time specified in this Change Order shall constitute the full accord and satisfaction, and complete adjustment to the Contract and includes all direct and indirect costs and effects related to, incidental to, and/or reasonably implied from such change in the contract terms, sum, scope of the Work and time.

Contractor:_____
Date

Architect/Engineer:_____
Date

Agency or Institution:_____
Date

DFCM: _____
Date

Funding Verification:_____
Date

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT _____ PROJECT NO: _____
AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM - (Owner) accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

_____

_____

The Owner acknowledges receipt of the following closeout and transition materials:

☐ As-built Drawings ☐ O & M Manuals ☐ Warranty Documents ☐ Completion of Training Requirements

A list of items to be completed or corrected (Punch List) is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof. The amount of _____(Twice the value of the punch list work) shall be retained to assure the completion of the punch list work.

The Contractor shall complete or correct the Work on the list of (Punch List) items appended hereto within _____ _____calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: $_____. If the list of items is not completed within the time allotted the Owner has the right to be compensated for the delays and/or complete the work with the help of independent contractor at the expense of the retained project funds. If the retained project funds are insufficient to cover the delay/completion damages, the Owner shall be promptly reimbursed for the balance of the funds needed to compensate the Owner.

_____	by:	_____	
CONTRACTOR (include name of firm)		(Signature)	DATE
_____	by:	_____	
A/E (include name of firm)		(Signature)	DATE
_____	by:	_____	
USING INSTITUTION OR AGENCY		(Signature)	DATE
_____	by:	_____	
DFCM (Owner)		(Signature)	DATE

4110 State Office Building, Salt Lake City, Utah 84114 cc: Parties Noted
telephone 801-538-3018 • facsimile 801-538-3267 • http://dfcm.utah.gov DFCM, Director

PROJECT MANUAL

MAINTENANCE SHOP BUILDING 1190
REMODEL DESIGN

UTAH NATIONAL GUARD
CAMP WILLIAMS, UTAH
DFCM #06012480

L.K. SORENSEN ASSOCIATES, INC.
3448 SOUTH MAIN STREET
SALT LAKE CITY, UTAH 84115
(801) 478-0800 (801) 478-0816 FAX

PROJECT MANUAL INDEX

PROJECT: BUILDING #1190 SHOP REMODEL DESIGN
UTAH NATIONAL GUARD
CAMP W. G. WILLIAMS, UTAH

DRAWING INDEX

GI001 COVER SHEET, MAPS, GENERAL INFORMATION

AS101	ARCHITECTURAL SITE PLAN
AD101	DEMOLITION FLOOR PLAN & ELEVATION / MEZZANINIE FRAMING PLAN / DETAILS
AE001	LIST OF ALTERNATES / GENERAL DEMOLITION, REMODEILNG & RENOVATIONS NOTES
AE101	FLOOR PLANS / REFLECTED CEILING PLAN
AE102	EQUIPMENT FLOOR PLAN / EQUIPMENT SCHEDULE
AE103	AIR COMPRESSOR BUILDING PLANS
AE201	EXTERIOR ELEVATIONS / DETAILS
AE301	SECTIONS / DETAILS
AE302	SECTIONS / DETAILS
AE601	DOOR SCHEDULE / DETAILS
AE602	WINDOW & FINISH SCHEDULE / DETAILS
P101	PLUMBING FLOOR PLAN
P201	PLUMBING SCHEDULES
M101	MECHANICAL FLOOR PLAN
M201	MECHANICAL SCHEDULES
EE001	SYMBOL LEGEND, SHEET INDEX
EE501	DETAILS
EE502	DETAILS
EE601	ONE-LINE DIAGRAM, FIRE ALARM RISER
EE602	LIGHTING FIXTURE & PANEL SCHEDULE
EE603	EQUIPMENT SCHEDULE
EE701	TYPICAL MOUNTING HEIGHT DETAILS
ED101	DEMOLITION PLAN
EL101	LIGHTING PLAN
EP101	POWER PLAN
EY101	FIRE ALARM PLAN

SECTION 01100 - SUMMARY

1.1 GENERAL

A. Project Identification: Project consists of Interior remodeling with exterior door and window replacement for building designated number 1190 to create shop and work space including plumbing, HVAC, electrical and communications systems on the Camp W. G. Williams campus for the Utah National Guard.

1. Project Location: Camp W. G. Williams, Riverton, Utah
2. Owner: Utah National Guard

B. Architect Identification: The Contract Documents, dated May 8, 2006, were prepared for Project by:

L. K. SORENSEN ASSOCIATES, INC.
ARCHITECTS/PLANNERS
3448 SOUTH MAIN STREET
SALT LAKE CITY, UTAH 84115
(801) 478-0800, FAX (801) 478-0816

C. The Work consists of demolition and saw cutting of concrete floors; removal of interior and exterior walls; preparation for new construction and finishes; new walls, ceilings, doors, and windows; toilet and shower rooms; millwork; mechanical HVAC, control, plumbing and fire protection systems; electrical lighting, power, communications and fire alarm systems; and interior finishes.

BASE BID: SHALL INCLUDE **ALL** WORK COMPLETE AS SHOWN OR SPECIFIED IN THE CONSTRUCTION DOCUMENTS INCLUDING, BUT NOT LIMITED TO, THE WORK REQUIRED TO PREPARE FOR THE INSTALLATION OF EVERY ALTERNATE ITEM AS SHOWN OR REQUIRED AS FOLLOWS.

ALTERNATE 1 PROVIDE AND CONSTRUCT THE AIR COMPRESSOR BUILDING COMPLETE AS SHOWN AND SPECIFIED READY FOR INSTALLATION OF AIR COMPRESS ALTERNATE 3.

NOTE: ALL PLUMBING, MECHANICAL (HVAC) SYSTEMS AND EQUIPMENT AND ALL ELECTRICAL POWER SERVICES FOR THE AIR COMPRESSOR BUILDING, AS SHOWN ON THE DRAWINGS AND AS SPECIFIED, SHALL BE INCLUDED IN THE BASE BID COST. PIPING AND CONDUIT SHALL BE STUBBED AND CAPPED AT THE AIR COMPRESSOR LOCATION.

ALTERNATE 2 PROVIDE AND INSTALL THE DUST COLLECTION SYSTEM AS SHOWN AND SPECIFIED INCLUDING CONNECTION TO ALL REQUIRED UTILITY SERVICES.

NOTE: ALL PLUMBING, MECHANICAL (HVAC) SYSTEMS AND EQUIPMENT AND ALL ELECTRICAL POWER SERVICES FOR THE DUST COLLECTION SYSTEM, AS SHOWN ON THE DRAWINGS AND AS SPECIFIED, SHALL BE INCLUDED IN THE BASE BID COST.

ALTERNATE 3 PROVIDE AND INSTALL THE AIR COMPRESSOR AND AIR DISTRIBUTION PIPING SYSTEM AS SHOWN AND SPECIFIED INCLUDING CONNECTION TO ALL REQUIRED UTILITY SERVICES.

NOTE: ALL PLUMBING AND ALL ELECTRICAL POWER SERVICES FOR THE AIR COMPRESSOR AND AIR DISTRIBUTION PIPING SYSTEM, AS SHOWN ON THE DRAWINGS AND AS SPECIFIED, SHALL BE INCLUDED IN THE BASE BID COST.

ALTERNATE 4 CHANGE ALL EIGHT (8) REMAINING, EXISTING 6'-3" BY 7'-0' WINDOWS NOT INCLUDED FOR REPLACEMENT BY BASE BID WORK REQUIREMENTS. THESE WINDOWS SHALL HAVE MULLION CONFIGURATION MATCHING THE EXISTING WINDOWS. THIS WORK SHALL INCLUDE THE REPAIR AND/OR REPLACEMENT OF EXISTING WINDOW OPENING PERIMETER FINISHES WITH 8-INCH CMU UNITS TO MATCH ADJACENT SURFACES WITH SEAL AND FINISH TO PROVIDE A WEATHER-SEALED INSTALLATION.

ALTERNATE 5 - PROVIDE AND INSTALL THE PAINT BOOTH AS SHOWN AND SPECIFIED INCLUDING CONNECTION TO ALL REQUIRED UTILITY SERVICES.

NOTE: ALL PLUMBING, MECHANICAL (HVAC) SYSTEMS AND EQUIPMENT AND ALL ELECTRICAL POWER SERVICES FOR THE PAINT BOOTH, AS SHOWN ON THE DRAWINGS AND AS SPECIFIED, SHALL BE INCLUDED IN THE BASE BID COST.

D. Project or elements of the project will be constructed under a general construction contract at the owner's discretion.

E. Use of Premises: Contractor shall have limited use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises will be defined during the pre-bid meeting, and confirmed during the pre-construction meeting.

F. Work Schedule: The UTNG works a four, ten-hour week from Monday through Thursday. The contractor is required to make arrangements to perform work on Fridays and weekends. When Holidays occur on weekends, arrangements will need to be made to allow work to proceed.

F. Separate Contract: Owner may will award separate contracts for performance of certain construction operations at Project site. Those operations may be conducted simultaneously with work under this Contract.

H. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

I. Products Ordered in Advance: Owner may negotiate Purchase Orders with suppliers of material and equipment to be incorporated into the Work. Owner may assign these Purchase Orders to Contractor. Costs for receiving, handling, storage if required, and installation of material and equipment may included in the Contract Sum.

1. Contractor's responsibilities are the same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.
2. Contractor shall review Shop Drawings, Product Data, and Samples and return them noting discrepancies or anticipated problems in use of product.
3. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
4. Contractor is responsible for protecting items from damage during storage and handling, including damage from exposure to the elements.
5. Contractor shall repair or replace items damaged as a result of Contractor's operations.

J. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.

K. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.2 PRODUCTS (Not Used)

1.3 EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01200 - PROJECT MEETINGS

1.1 GENERAL

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Pre-construction conferences.
2. Pre-installation conferences.
3. Progress meetings.

B. Pre-construction Conference: Schedule a pre-construction conference before starting construction. Review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; and other concerned parties shall attend.
2. Participants shall be familiar with the Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Critical work sequencing.
   c. Submittal of Shop Drawings, Product Data, and Samples.
   d. Use of the premises.

C. Pre-installation Conferences: Conduct a conference before each activity that requires coordination with other operations.

1. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation shall attend. Advise the Architect of scheduled meeting dates.
2. Review the progress of other operations and preparations for the activity under consideration at each pre-installation conference, including requirements for the following:
   a. Compatibility problems and acceptability of substrates.
   b. Time schedules and deliveries.
   c Manufacturer's recommendations.
   d. Warranty requirements.
   e. Inspecting and testing requirements.
3. Record significant discussions and agreements and disagreements, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.
4. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate actions necessary to resolve problems and reconvene the conference.

D. Progress Meetings: Conduct progress meetings at the Project Site at regular intervals. Notify the Owner and the Architect of scheduled dates. Coordinate meeting dates with preparation of the payment request.

1. Attendees: The Owner, Architect, and other entities concerned with current progress or involved in planning, coordination, or future activities shall be represented. Participants shall be authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous meeting. Review items of significance that could affect progress. Include topics for discussion appropriate to Project status.
3. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule.

Determine how to expedite construction behind schedule; secure commitments from parties involved to do so. Discuss revisions required to insure subsequent activities will be completed within the Contract Time.

4. Review the present and future needs of each entity present, including the following:
   a. Time.
   b. Sequences.
   c. Status of submittals.
   d. Deliveries and off-site fabrication problems.
   e. Temporary facilities and services.
   f. Quality and work standards.
   g. Change Orders.
5. Reporting: Distribute meeting minutes to each party present and to parties who should have been present. Include a summary of progress since the previous meeting and report.

E. Schedule Updating: Revise the Contractor's Construction Schedule after each meeting where revisions have been made. Issue the revised schedule concurrently with the report of each meeting.

1.2 PRODUCTS: (Not Applicable)

1.3 EXECUTION: (Not Applicable)

END OF SECTION 01200

SECTION 01310 - COORDINATION

1.1 GENERAL

A. This Section includes requirements for coordinating construction operations including, but not necessarily limited to, the following:

1. Coordination drawings.
2. Administrative and supervisory personnel.
3. Cleaning and protection.

B. Coordinate construction to assure efficient and orderly installation of each part of the Work. Coordinate operations that depend on each other for proper installation, connection, and operation.

1. Schedule operations in the sequence required to obtain the best results where installation of one part depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

C. Administrative Procedures: Coordinate scheduling and timing of required procedures with other activities to avoid conflicts and assure orderly progress. Such activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Delivery and processing of submittals.
3. Progress meetings.
4. Project closeout activities.

D. Conservation: Coordinate construction to assure that operations are carried out with consideration for conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not incorporated in, the Work.

E. Coordination Drawings: Prepare coordination drawings if needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space necessitates maximum utilization of space for efficient installation of different components.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Inspection of Conditions: Require Installers of major components to inspect substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordinate temporary enclosures with inspections and tests to minimize the need to uncover completed construction.

C. Clean and protect construction in progress and adjoining materials, during handling and installation. Apply protective covering to assure protection from damage.

D. Clean and maintain completed construction as necessary through the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

E. Limiting Exposures: Supervise construction to assure that no part is subject to harmful, dangerous, or damaging exposure. Such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Water or ice.
5. Solvents and chemicals.
6. Abrasion.
7. Soiling, staining, and corrosion.
8. Combustion.

END OF SECTION 01310

SECTION 01330 - SUBMITTALS

1.1 GENERAL

A. Submittal Procedures: Coordinate submittal preparation with construction, fabrication, other submittals, and activities that require sequential operations. Transmit in advance of construction operations to avoid delay.

1. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.
2. Processing: Allow 2 weeks for initial review. Allow more time if the Architect must delay processing to permit coordination. Allow 2 weeks for reprocessing.
   a. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.
3. Submittal Preparation: Place a permanent label on each submittal for identification. Provide a 4- by 5-inch (100- by 125-mm) space on the label or beside title block to record review and approval markings and action taken. Include the following information:
   a. Project name.
   b. Date.
   c. Name and address of the Architect.
   d. Name and address of the Contractor, subcontractor, supplier and/or manufacturer.
   e. Number and title of appropriate Specification Section, drawing number and detail references, as appropriate.
4. Submittal Transmittal: Package each submittal appropriately. Transmit with a transmittal form. The Architect will not accept submittals from sources other than the Contractor.
   a. The Architect will not accept submittals without review and action stamp by the General Contractor.
   b. **Submittals: Submit 4 copies; submit 6 copies where required for maintenance manuals. The Architect will retain one and return the others marked with action taken.**

B. Contractor's Construction Schedule: Prepare a horizontal bar-chart-type, contractor's construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first working day of each week. Use the same breakdown of Work indicated in the "Schedule of Values." Indicate estimated completion in 10 percent increments. As Work progresses, mark each bar to indicate actual completion.

1. Submit within 30 days of the date established for "Commencement of the Work."
2. Secure performance commitments from parties involved. Coordinate each element with other activities; include minor elements involved in the Work. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
2. Coordinate with the Schedule of Values, list of subcontracts, Submittal Schedule, payment requests, and other schedules.
4. Indicate completion in advance of Substantial Completion. Indicate Substantial Completion to allow time for the Architect's procedures necessary for certification of Substantial Completion.
5. Work Stages: Indicate important stages for each portion of the Work.
6. Submittal Schedule: After developing the Contractor's Construction Schedule, prepare a schedule of submittals. Submit within 10 days of submittal of the Construction Schedule.
7. Coordinate with list of subcontracts, Schedule of Values, list of products, and the Contractor's Construction Schedule.
8. Schedule Distribution: Distribute copies of the Contractor's Construction Schedule and the Submittal Schedule to the Architect, Owner, subcontractors, and parties required to comply with submittal dates. Post copies in the field office.
9. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their Work and are no longer involved in construction activities.

C. Daily Construction Reports: Prepare a daily report recording events at the site. Submit duplicate copies to the Architect at weekly intervals. Include all relevant data and the following information:

1. List of subcontractors at the site including number of workers on each task.
2. High and low temperatures, general weather conditions.
3. Accidents and unusual events.
4. Stoppages, delays, shortages, and losses.
5. Meter readings and similar recordings.
6. Emergency procedures.
7. Orders and requests of governing authorities.
8. Services connected, disconnected.
9. Equipment or system tests and startups.
10. Substantial Completions authorized.

D. Product Data: Collect Product Data into a single submittal for each element of construction. Mark each copy to show applicable choices and options.

   1. Where Product Data includes information on several products, mark copies to indicate applicable information. Include the following information:
      a. Manufacturer's printed recommendations.
      b. Compliance with trade association standards.
      c. Compliance with recognized testing agency standards.
      d. Application of testing agency labels and seals.
      e. Notation of dimensions verified by field measurement.
      f. Notation of coordination requirements.
   2. Distribution: Furnish copies to installers, subcontractors, suppliers, and others required for performance of construction activities. Show distribution on transmittal forms. Do not proceed with installation until a copy of Product Data is in the Installer's possession.

E. Samples: Submit full-size Samples cured and finished as specified and identical with the material proposed. Mount Samples to facilitate review of qualities.

   1. Submit Samples for review of size, kind, color, pattern, and texture, for a check of these characteristics, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations.

F. Quality Assurance Submittals: Submit quality-control submittals, including design data, certifications, manufacturer's instructions, and manufacturer's field reports required under other Sections of the Specifications.

   1. Certifications: Where certification that a product or installation complies with specified requirements is required, submit a notarized certification from the manufacturer certifying compliance.
   2. Signature: Certification shall be signed by an officer authorized to sign documents on behalf of the company.

G. Architect's Action: Except for submittals for the record or information, where action and return are required, the Architect will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.
   1. Action Stamp: The Architect will stamp each submittal with an action stamp. The Architect will mark the stamp appropriately to indicate the action taken.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01330

SECTION 01400 - QUALITY CONTROL

1.1 GENERAL

A. Quality-control services include inspections, tests, and related actions, including reports, by independent agencies, and by governing authorities under the direction of the Contractor. They do not include contract activities performed by the Architect.

1. Contractor Responsibilities: Contractor shall provide all inspections and tests specified and required by authorities having jurisdiction and as described herein.
   a. The Contractor shall employ and pay a qualified independent testing agency to perform all Quality Control services.
   b. All costs for these services are included in the Contract Sum.

B. Retesting: The Contractor is responsible for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.

1. The cost of retesting is the Contractor's responsibility where tests performed indicated noncompliance with requirements.

C. Auxiliary Services: Cooperate with governing agencies performing inspections and tests. Provide auxiliary services as requested. Notify the agency in advance of operations to permit assignment of personnel. Auxiliary services include the following:

1. The contractor shall schedule and coordinate inspection performed by all other governing agencies, and shall provide or perform the following:
   a. Provide access to the Work.
   b. Furnish incidental labor and facilities to assist inspections and tests.
   c. Take adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
   d. Provide facilities for storage and curing of test samples.
   e. Deliver samples to testing laboratories.
   f. Provide preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   g. Provide security and protection of samples and test equipment.

D. Duties of the Testing Agency: The testing agency shall cooperate with the Contractor in performing its duties. The agency shall provide qualified personnel to perform inspections and tests.

1. The agency shall notify the Architect, appropriate Engineers, and the Contractor of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency shall not release, revoke, alter, or enlarge requirements or approve or accept any portion of the Work.
3. The agency shall not perform duties of the Contractor.
4. The Contractor is responsible for scheduling inspections, tests, taking samples, and similar activities.

E. Submittals: The testing agency shall submit a certified written report, in duplicate, of each inspection and test to the Architect and the Structural Engineer. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection or test through the Contractor.

1. Submit additional copies of each report to the governing authority, when the authority so directs.
2. Report Data: Reports of each inspection, test, or similar service include, but are not limited to, the following:
   a. Date of issue.
   b. Project title and number.

c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.2 PRODUCTS

A. TESTING AGENCY SHALL BE APPROVED BY THE OWNER.

B. THE COST FOR THESE SERVICES SHALL BE INCLUDED IN THE CONTRACTOR=S SCOPE OF WORK.

1.3 EXECUTION

A. Repair and Protection: Upon completion of inspection, testing, and sample taking, repair damaged construction. Restore substrates and finishes. Comply with Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for inspection and testing.

END OF SECTION 01400

SECTION 01420 - REFERENCE STANDARDS AND DEFINITIONS

1.1 GENERAL

A. Definitions: Basic contract definitions are included in the Conditions of the Contract.

1. "Indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
2. "Directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
3. "Approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
4. "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
5. "Furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
6. "Install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
7. "Provide" means to furnish and install, complete and ready for the intended use.
8. "Installer" is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
9. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
10. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
11. Specification Format: These Specifications are organized into Divisions and Sections based on CSI's 16-Division format and MasterFormat's numbering system.
12. Abbreviated Language: Language used in Specifications is abbreviated. Implied words and meanings shall be interpreted as appropriate. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
13. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
14. Copies of Standards: Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
15. Abbreviations and Names: Where acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Co.'s "Encyclopedia of Associations," available in most libraries.
16. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION (Not Applicable)

END OF SECTION 01420

SECTION 01500 - TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

1.1 GENERAL

A. Summary: This Section specifies construction facilities and temporary controls including temporary utilities, support facilities, and security and protection facilities.

B. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.
6. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
7. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
8. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.2 PRODUCTS

A. Materials: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Fire Extinguishers: Hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.3 EXECUTION

A. Installation, General: Use qualified personnel to install temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

1. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
2. Conditions of Use: Keep temporary facilities clean and neat in appearance. Operate safely and efficiently. Relocate as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

B. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.

C. Temporary Water Service: Install temporary water service and distribution piping of sizes and

pressures adequate for construction. Maintain service until permanent water service is in use. Sterilize piping prior to use.

D. Temporary Electric Power: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear. Install service underground.

1. Temporary Lighting: Provide temporary lighting with local switching to fulfill security requirements and illumination for construction operations and traffic conditions.

E. Temporary Heat: Provide temporary heat for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations. Coordinate ventilation requirements to produce ambient condition required and minimize consumption of energy.

F. Temporary Telephones: Provide temporary telephone service for personnel engaged in construction. Install a separate line for each temporary office and first-aid station. Provide a dedicated telephone line for a fax machine in the field office. At each telephone, post a list of important telephone numbers.

G. Sanitary Facilities: Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers.

1. Toilets: Install self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
2. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled drinking-water units.

H. Support Facilities Installation: Locate field offices, storage sheds, and other construction and support facilities for easy access. Maintain facilities until near Substantial Completion. Remove prior to Substantial Completion.

1. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.
   a. Furnish field offices with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
   b. Provide a telephone with an answering machine and a fax machine at the project site.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction from exposure, foul weather, other construction operations, and similar activities. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions.

J. Project Signs: Install project identification and other signs where indicated to inform the public and persons seeking entrance to the Project. Support on framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs. Engage an experienced sign painter to apply graphics.

1. Sign size will be four feet by eight feet with appropriate mounting posts.
2. Comply with lettering text and format details indicated, or to be provided by the Architect.

K. Waste Collection and Disposal: Collect waste daily. Comply with requirements of NFPA 241. Enforce requirements strictly. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

L. Temporary Fire Protection: Until permanent facilities supply fire-protection needs, install and maintain temporary fire-protection facilities of types needed to protect against controllable fire losses. Comply with NFPA 10 and NFPA 241.

1. Locate fire extinguishers where convenient and effective for their intended purpose.

M. Barricades, Warning Signs, and Lights: Comply with code requirements for erection of barricades. Paint with appropriate colors, graphics, and warning signs. Where appropriate and needed, provide lighting, including flashing red or amber lights.

N. Environmental Protection: Operate temporary facilities and conduct construction in ways that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making equipment to hours that will minimize complaints.

O. Maintenance: Maintain facilities in operating condition until removal. Protect from damage by freezing temperatures and similar elements. Maintain temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid damage.

P. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect during excavation.

Q. Termination and Removal: Remove each temporary facility when the need has ended, when replaced by a permanent facility, or no later than Substantial Completion. Complete or restore permanent construction delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during the construction period.
3. Replace air filters and clean inside of ductwork and housings.
4. Replace worn parts and parts subject to unusual operating conditions.
5. Replace burned out lamps.

END OF SECTION 01500

SECTION 01600 - MATERIALS AND EQUIPMENT

1.1 GENERAL

A. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.

1. "Named Products" are items identified by the manufacturer's product name, including make or model number or designation, shown or listed in the manufacturer's published product literature.

B. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

D. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected.

E. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage and to prevent overcrowding construction spaces. Coordinate with installation to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
2. Deliver products in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
3. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
4. Store products to facilitate inspection and measurement of quantity or counting of units. Store heavy materials away from the structure in a manner that will not endanger the supporting construction.
5. Store products subject to damage by the elements aboveground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.2 PRODUCTS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

B. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

1. Where products are specified by name, accompanied by the term "or equal," comply with provisions concerning "substitutions" to obtain approval for use of an unnamed product.

C. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply and are recommended for the application. Manufacturer's recommendations may be contained in product literature or by the manufacturer's

certification of performance.

D. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.

E. Visual Matching: Where Specifications require matching a Sample, the Architect's decision on whether a product matches will be final. Where no product in the specified category matches and complies with other requirements, comply with provisions concerning "substitutions" for selection of a matching product in another category.

F. Visual Selection: Where requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product that complies with other requirements. The Architect will select the color, pattern, and texture from the product line selected.

1.3 EXECUTION

A. Comply with manufacturer's instructions for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631 - PRODUCTS AND SUBSTITUTIONS

1.1 GENERAL

A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work. Where it is not possible to do so, match separate procurement as closely as possible to the extent that the product selection process is under the Contractor's control.

B. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock.

C. "Named Products" are items identified by manufacturer's product name, including make or model designation indicated in the manufacturer's product literature.

D. "Materials" are products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

E. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

F. Nameplates: Except for required labels and operating data, do not attach manufacturer's nameplates or trademarks on surfaces exposed to view in occupied spaces or on the exterior.

G. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an inconspicuous accessible surface. The nameplate shall contain the following information and essential operating data:

1. Name of product and manufacturer.
2. Model and serial number.
3. Capacity, Speed and Ratings.

H. Product Delivery, Storage, and Handling: Deliver, store and handle products in accordance with manufacturer's recommendations, using methods that will prevent damage, deterioration and loss.

1. Schedule delivery to minimize long-term storage and prevent overcrowding construction spaces. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
2. Deliver products in manufacturer's original sealed container or packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
3. Inspect products on delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.
4. Store products to facilitate inspection and measurement of quantity or counting of units. Store heavy materials away from the structure in a manner that will not endanger supporting construction.
5. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

I. Product Selection: Provide products that comply with the Contract Documents, are undamaged and unused at installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

J. Descriptive Specification Requirements: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that provides the characteristics and otherwise complies with requirements as approved by the Architect.

K. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply and are recommended for the application as approved by the Architect.

L. Compliance with Standards: Where Specifications require compliance with a standard, select a product that complies with the standard specified.

M. Visual Matching: Where Specifications require matching a Sample, the Architect's decision on whether a proposed product matches is final. Where requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product that complies with other requirements. The Architect will select color, pattern and texture from the product line selected.

N. Substitutions - Conditions: The Contractor's requests for substitutions may be considered when they are reasonable, timely, fully documented, and when they are approved by the architect.

O. Submittals: Include the following information, as appropriate, in each request for substitution:

1. Provide complete product documentation, including product data and samples, where appropriate.
2. Provide detailed performance comparisons and evaluation, including testing laboratory reports where applicable.
3. Provide coordination information indicating the effect of the substitution on other work and the time schedule.
4. Provide cost information for the proposed change order.
5. Provide the Contractor's general certification of the recommended substitution.

P. Change Order: Approval of substitutions is possible only by the change order procedure.

Q. Delivery, Storage, and Handling: Receive, store and handle products, materials and equipment in a manner which will prevent loss, deterioration and damage. Schedule deliveries so as to minimize long-term storage at the project site.

1.2 PRODUCTS (Not used)

1.3 EXECUTION

A. Installation of Products: Comply with manufacturer's instructions and recommendations for installation of products. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01631

SECTION 01731 - CUTTING AND PATCHING

1.1 GENERAL

A. Operational Limitations: Do not cut and patch operating elements in a manner that would reduce their capacity to perform as intended. Do not cut and patch operating elements in a manner that would increase maintenance or decrease operational life or safety.

B. Visual Requirements: Do not cut and patch exposed construction in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

C. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval before cutting and patching the following structural elements:
    a. Foundation construction.
    b. Bearing and retaining walls.
    c. Structural members and primary wood framing.

1.2 PRODUCTS

A. Use materials identical to existing materials. Use materials that visually match adjacent surfaces to the fullest extent possible if identical materials are unavailable. Use materials whose performance will equal that of existing materials.

1.3 EXECUTION

A. Examine surfaces to be cut and patched and conditions under which work is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action.

B. Before proceeding, meet with parties involved. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect existing construction to prevent damage. Provide protection from adverse weather conditions for portions that might be exposed during cutting and patching operations.

1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
2. Avoid cutting pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

E. Performance: Employ skilled workmen. Proceed at the earliest feasible time and complete without delay.

1. Cut construction to install other components or perform other construction and subsequent fitting

and patching required to restore surfaces to their original condition.

F. Cutting: Cut using methods that will not damage elements retained or adjoining construction. Comply with the original Installer's recommendations.

1. Use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.

G. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar items. Clean piping, conduit, and similar features before applying paint or finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01731

SECTION 01740 - WARRANTIES AND BONDS

1.1 GENERAL

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

1. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
2. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
3. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
4. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
5. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

E. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.

1. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

F. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.

3. Provide four (4) copies of the warranties.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Provide warranties on products and installations as specified in all Sections of the Specifications:

END OF SECTION 01740

SECTION 01770 - CONTRACT CLOSEOUT

1.1 GENERAL

A. Closeout requirements for specific construction activities are also included in the appropriate Sections in Divisions 2 through 16.

B. Substantial Completion: Before requesting inspection for certification of Substantial Completion, complete the following:

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show only 100 percent completion for the Work claimed as substantially complete.
2. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Submit record drawings, maintenance manuals, final project photographs, and similar final record information.
5. Deliver tools, spare parts, extra stock, and similar items.
6. Changeover locks and transmit keys to the Owner.
7. Complete startup testing of systems and instruction of operation and maintenance personnel. Remove temporary facilities, mockups, construction tools, and similar elements.
8. Complete final cleanup requirements, including touch-up painting.
9. Touch up and repair and restore marred, exposed finishes.

C. Inspection Procedures: On receipt of a request for inspection, the Architect will proceed or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

D. Final Acceptance: Before requesting inspection for certification of final acceptance and final payment, complete the following:

1. Final payment request with releases and supporting documentation. Include insurance certificates where required.
2. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.

E. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or obligations that have not been fulfilled but are required.
2. If necessary, reinspection will be repeated.

F. Record Document Submittals: Do not use record documents for construction. Protect from loss in a secure location. Provide access to record documents for the Architect's reference.

G. Record Drawings: Maintain a set of prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.

1. Mark sets with red pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Organize record drawing sheets into manageable sets. Bind with durable-paper cover sheets; print titles, dates, and other identification on the cover of each set.
3. Provide other record drawings identified in individual specification sections.

H. Record Specifications: Maintain one copy of the Project Manual, including addenda. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications. Give attention to substitutions and selection of options and information on concealed construction. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

I. Maintenance Manuals: Organize operation and maintenance data into sets of manageable size. Bind in individual, heavy-duty, 2-inch (51-mm), 3-ring, binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder.

1. SEE OTHER DIVISIONS FOR SPECIFIC REQUIREMENTS.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires maintenance to provide instruction in proper operation and maintenance.

1. SEE OTHER DIVISIONS FOR SPECIFIC REQUIREMENTS.

B. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.

1. Remove labels that are not permanent labels.
2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
5. Clean the site of rubbish, litter, and foreign substances. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.

END OF SECTION 01770

SECTION 02060 - BUILDING DEMOLITION

1.1 GENERAL

A. Definitions: As follows:

1. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
2. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
3. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
4. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

B. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.

D. Record drawings at Project closeout according to Division 1 Section "Contract Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

E. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

F. Owner assumes no responsibility for actual condition of buildings to be demolished.

G. Storage or sale of removed items or materials on-site will not be permitted.

1.2 PRODUCTS (Not Applicable)

1.3 EXECUTION

A. Survey the condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.

B. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

C. Utility Requirements: Locate, identify, shut off, disconnect, and seal or cap off indicated utility services serving structures to be demolished.

1. Provide temporary services during interruptions to existing utilities to remain, as acceptable to Owner and to governing authorities.

D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

E. Conduct demolition operations and remove debris to ensure minimum interference with roads,

streets, walks, and other adjacent occupied and used facilities.

F. Conduct demolition operations to prevent injury to people and damage to adjacent buildings, facilities, and site improvements to remain. Ensure safe passage of people around demolition area.

G. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of buildings to be demolished and adjacent buildings to remain.

H. Explosives: Use of explosives will not be permitted.

I. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

J. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

K. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

L. Disposal: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Do not burn demolished materials.
2. Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 02060

SECTION 02703-UTILITY INSTALLATIONS AND IMPROVEMENTS

PART 1 - GENERAL

A. All utility work shall conform with the requirements of Utility Service Companies, Municipal Utility authorities, and/or Base Engineering

B. Refer to all other Specification Sections.

C. DESCRIPTION: The work of this section includes the provision of all items, articles, materials, operations, or methods listed, mentioned or scheduled on the drawings and/or herein specified, including labor, finished surface repair, materials, equipment, trenching, bedding and incidentals necessary and required for their completion.

1. The work includes all utility piping, valves, connection, and other utility installations as shown on the drawings.

2. All connections to existing utility service mains shall be completed and made operational.

3. Systems, in general, shall include, but not be limited to, trenching, bedding, backfill, compaction, piping, fittings, manholes, concrete encasement, boxes, castings and covers, clean-outs, valves and valve boxes, and all other incidental items required for a complete and operational utility system.

4. All work shall be done in accordance with the Intenational Building Code, Utah State Plumbing Code, Utah State Safe Drinking Water Act, Municipal Fire Marshal approved standards, N.F.P.A. and all local and city codes where applicable. Most restrictive interpretation shall apply to all work.

5. The work includes removing and replacing ground surface features required to complete all utility installations.

6. Contractor shall repair all construction damaged or disturbed areas of existing construction at his own expense.

a. Repair of existing finished surfaces disturbed by the construction shall be to original standard prior to the new construction. All repaired surfaces shall match existing surfaces in material and alignment.

7. Contractor shall coordinate all connections and disruption of water service. Contractor shall notify the Owner in writing ten (10) days prior to connecting to any service.

D. SAFETY: Contractor shall be responsible for safety in the project area and shall take all necessary precautions to insure a safe work environment.

E. GENERAL REQUIREMENTS: All primary electrical service, transformers, transformer pads, communication service lines and posts and gas service lines to be coordinated with each utility company. Costs for these services shall be included in the cost of this work by the contractor.

PART 2 - MATERIALS

A. WATER SYSTEM: Water Piping: All piping shall be U.L. listed and shall be as follows:

B. Water Piping Less Than Four-Inch Diameter: All piping shall be suitable for domestic

water service use. Piping shall be copper as shown on drawings.

1. Copper Water Piping and Fittings: Copper pipe shall be Type "K" conforming to the requirements of ASTM specification B-88. Type 'K' shall be used for all exterior and underground installations when indicated on the drawings.

2. All copper piping shall be connected with solder-type fittings, unless otherwise specified. The copper piping 1/2 inch diameter may be annealed or drawn-tempered.

3. Dielectric Fittings: Required at all copper-ferrous metal connections.

C. Water piping four-inch diameter and larger: all piping shall be suitable for domestic water service use. PVC Pipe: ASTM D 1785, schedule 40.

1. Plastic, pipe-flange gasket, gaskets, joining anchors: type and material recommended by piping system manufacture.

2. Valves: 4-inch and larger valvers used in buried water lines shall be located in concrete boxes in accordance with manufacturers' recommendations and with UTNG Camp Williams Engineering requirements.

3. Provide concrete thrust blocks at connection with existing water line and at all direction changes.

4. 4-inch and larger water line systems shall comply with UTNG Camp Williams base Engineering standards in their entirety.

D. Valves (1-1/2 Inch and Smaller) (when shown on drawings): Valves 1-1/2" and smaller used in the buried water line and not shown to be located in concrete boxes shall be "Mark II Oriseal" valves, Minneapolis Top, Solid Tee Head, "Mueller H-10287", as manufactured by Mueller Company, Decatur, Illinois, or approved equal. Valve boxes for "Mark II Oriseal" valves one inch and smaller shall be the extension type curb box with Minneapolis pattern base. The box shall be a Mueller H-10300, as manufactured by the Mueller Company, Decatur, Illinois, or approved equal. Valve boxes for valves 1-1/4 inch through 1-11/2 inches shall be the extension type box with Minneapolis pattern base. For 1-1/4 inch valves the box shall be a Mueller H-10302, and for 1-1/2 inch valves the box shall be a Mueller H-10304 as manufactured by the Mueller Company, Decatur, Illinois or approved equals.

E. SEWER SYSTEM:

1. PVC Pipe: Pipe shall be Bell and Spigot 'PVC' (13 ft.) ASTM D-3034 SDR 35 Sewer Pipe with watertight gasketed joint as approved by Utah State Board of Health. Piping shall be "CertainTeed" or "Johns-Manville". PVC piping shall be used unless otherwise shown on the drawings.

F. PIPE CONNECTORS: Resilient, complying with ASTM C 923.

G. GROUT: Neat Portland Cement and water.

H. BEDDING MATERIAL: All utility pipe buried underground and installed under this section shall be placed in bedding material. Materials shall be predominantly sand and gravel, having a plasticity index less than 6. This material shall be used in utility conduit installation adjacent to utility conduit.

I. Bedding Material Gradation:

Sieve Designation

Square Openings	Percent Passing
1-inch	100
3/4-inch	90-100
1/2-inch	20-55
3/8-inch	1-15
No. 4	0-5

J. UNDERGROUND-TYPE PLASTIC LINE MARKERS: Manufacturer's standard, permanent, bright colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION: SEWER LINE BURIED BELOW". Tape to be "Allen Systems, Inc.", "EMED Co., Inc.","Seton Name Plate Corporation", or approved equal. Marking tape shall be used for all non-ferrous pipe installations.

K. WASHED GRAVEL: Washed gravel shall be rounded river rock or processed aggregate 1 inch thru 3/8 inch in size with 50% by volume being 1/2 inch and larger. Washed gravel shall be placed to the lines and grades shown on drawings and as a minimum under all utility piping, storm drain piping, drainage structures, manholes and storm drain boxes. Minimum washed gravel depth shall be 4 inches.

L. CONCRETE: According to Division 3.

M. REINFORCING: According to Division 3.

N. BOLTS: AISC A 325 unless otherwise noted.

O. MISCELLANEOUS STEEL: AISC A-36.

PART 3 - EXECUTION

A. CLEARING AND GRUBBING AND DISPOSAL OF WASTE MATERIAL: Before starting excavation in any area, all necessary clearing and grubbing in that area shall have been completed. All excess debris, trees, sod and excavated material removed from construction disturbed areas shall be hauled, handled and disposed of off site.

B. EXCAVATION: Excavation for piping shall be excavated to the lines and grades or elevations shown on the drawings or as designated on the ground. Excavations shall be of sufficient size to permit the placing and backfilling of piping. All excavation shall be considered unclassified.

1. Piping: The width of trenches shall permit satisfactory jointing and accepted tamping of the bedding material under and around the pipe. Unsuitable material shall be replaced with washed gravel material and compacted. Excavation of unsuitable foundation material shall be included in pipe excavation.

2. Contractor shall provide all materials and labor required for trench shoring or deep trench steel box used for pipe laying in deep trenches. Contractor shall provide all required equipment and supervision to insure safety according to "OSHA" standards for trench construction and excavation.

3. Bedding material, washed gravel and placement shall be included in pipe excavation or manhole and minor structure excavation.

4. Contractor shall provide equipment, labor and all incidental items required to pump, drain or other means to de-water and maintain dry trench bottom conditions for all pipe laying operations.

5. UTNG environmental personnel shall observe all utility line excavations. Contractor shall arrange and coordinate these observations.

C. UTILIZATION OF EXCAVATED MATERIALS: All suitable excavated material shall be utilized as backfill or embankment. No excavated material shall be placed in stock piles and left on the site unless approved by the architect. All surplus material shall be disposed of off the project site. No excavated material shall be deposited in a manner that will endanger the finished structures.

D. COMPACTION: Disturbed earth foundation shall be mechanically tamped at optimum moisture conditions to provide 95 percent of the maximum dry density as determined by ASTM D-1557. All backfill for piping shall be layer placed and compacted. All backfill shall be compacted to 95 percent of maximum dry density as determined by ASTM D-1557.

1. Compaction shall be obtained by mechanical tamping equipment and methods. Jetting with water, puddling, etc., methods of consolidation is not acceptable.

E. BEDDING: Bedding material shall be placed in maximum 8-inch layers to the lines and grades shown on the drawings. Each layer shall be mechanically tamped and compacted.

F. BACKFILL FOR PIPE: All native or approved material for all pipe backfill shall be placed in maximum 12-inch layers excluding all rock in excess of 8-inches in any dimension. Material shall be placed to the lines and grades shown on the drawing. Each layer shall be mechanically tamped and compacted.

G. PIPE INSTALLATION-SANITARY SEWER PIPE: A minimum lift of washed gravel and/or bedding material shall be placed and compacted in the entire trench bottom prior to pipe section installations. Contractor shall hand excavate all bell locations to provide continuous bearing of pipe section along its entire length.

1. Piped installation shall be such that bell end is up grade. Gradient and alignment shall be with laser equipment installation.

2. No pipe shall be placed in service until a suitable outlet is provided. Installation shall include backfill bedding and compaction. Bedding shall be layer placed to point 12-inches above top of pipe unless noted otherwise on drawing.

3. All pipe connections to minor concrete structures shall be grouted smooth.

H. Gaskets: Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

I. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

J. Cleaning Pipe: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

K. Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

L. TESTS: All testing of utility piping shall be as follows

1. Water Lines: All water lines shall be tested hydrostatically at 175 psi and shall show a pressure drop not more than 5 psi in a 24-hour period.

2. Sanitary System: The sanitary sewer piping shall be tested by plugging all outlets and filling the lines with water to point 15 feet above highest elevation of pipe invert being included in test. The water level shall not drop more than 3-inches in 1 hour. All joints within the project shall be inspected for visible leaks.

3. Approved air test may be used in lieu of water test specified.

4. Defective Work: If inspection or tests show defects, such defective work or material shall be replaced or corrected and inspection and tests shall be repeated. All repairs to piping shall be made with new materials. No caulking or screwed joints or holes will be acceptable.

5. The entire project site shall be cleaned up, finished surfaces repaired and all disturbed surface features repaired at the time of final acceptance.

M. CLEANOUTS: Cleanouts shall be located and installed in accordance with governing code requirements.

N. SLOPE OF PIPE: Sanitary sewer piping shall be run with slopes 0.0050 feet per foot or greater. Storm drain piping minimum slope shall be 0.0050 feet per foot. Water piping shall be graded to eliminate air pockets.

O. MINIMUM BURY OF PIPE: All piping shall be protected against freezing. Minimum 36-inch depth.

P. Sewer piping and potable water piping shall not be run in common trench.

Q. Disinfection and Cleaning of Potable Water Lines: All works shall be according to Utah State Board of Health Standards. All new, cleaned or repaired existing water mains or appurtenances shall be disinfected in accordance with AWWA Standard C601. Certification in writing is required upon completion of work.

R. GUARANTEE: The Contractor assumes the full responsibility imposed by the guarantee as set forth herein and in the General Conditions and should protect himself through proper guarantees from equipment and special equipment contractors and from subcontractors as their interests may appear.

1. The Contractor shall make prompt and free of charge, upon notice from the Owner, any necessary repairs due to defective workmanship or materials that may occur during a period of one year from date of Substantial Completion.

END OF SECTION 02703

SECTION 03100 - CONCRETE FORM WORK

1.1 GENERAL

A. Related Work Described Elsewhere:

1.	Concrete reinforcement	Section 03200
2.	Concrete	Section 03300
3.	Embedded metal items	Section 05500
4.	Other items	Mechanical Division 15 Electrical Division 16

B. Qualifications of Workman: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed, who shall direct all work performed under this section.

C. Codes and Standards (latest edition): In addition to complying with all pertinent codes and regulations including the 2003 edition of the INTERNATIONAL BUILDING CODE, comply with all pertinent recommendations contained in "Recommended Practice for Concrete FORM WORK", publication ACI 347 of the American Concrete Institute, latest edition.

1. Where provisions of pertinent codes and standards conflict with the requirements of this Section of these Specifications the more stringent provisions shall govern.

D. Protection: Use all means necessary to protect FORM WORK materials before, during and after installation and to protect the installed work and materials of all other trades.

E. Placements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional costs to the Owner.

1.2 PRODUCTS

A. Products: Use approved removable panel type metal forms. Recondition and lean before reusing. Do not oil or apply material which will stain exposed concrete.

1. All form sealers shall be first quality of their respective kinds and subject to the approval of the Owner containing no oil or paraffin.

B. Ties and Spreaders: All form ties shall be AA type which does not leave an open hole through the concrete and which permits neat and solid patching at every hole. Ties shall have a 1 ½" break back.

1. When forms are removed, all metal shall be not less than one inch from the surface.
2. Do not use wire ties and wood spreaders.
3. Alternate forming systems may be used subject to the approval of the Architect.
4. All other materials, not specifically described but required for proper completion of concrete FORM WORK, shall be as selected by the Contractor subject to the advance approval of the Architect.

1. 3 EXECUTION

A. Execution: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

1. Verify that forms may be constructed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.

2. In the event of discrepancy, immediately notify the Architect.
3. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

B. Construction of Forms: Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to prevent excessive deflection when filled with wet concrete.

1. Form all footings.
2. Form required for all cast-in-place concrete to the shapes, sizes, lines, and dimensions indicated on the Drawings.
3. Exercise particular care in the layout of forms to avoid necessity for cutting of concrete after it is in place.
4. Make proper provision for all openings, offsets, recesses, anchorage, blocking, and other features of the work as shown or required.
5. Perform all forming required for work of other trades and do all cutting and repairing of forms required to permit such installation.
6. Carefully examine the Drawings and Specifications and consult with other trades as required relative to provision for openings, reglets, chases, and other items in the forms.
7. Set all required steel frames, angles, grilles, bolts, inserts, and other such items required to be anchored in the concrete before the concrete is placed.
8. Properly brace and tie the forms together so as to maintain position and shape and to ensure safety to personnel.
9. Construct all bracing, supporting members, and centering of ample size and strength to safely carry, without excessive deflection all dead and live loads to which they may be subjected.
10. Properly space the forms apart and securely tie them together, using metal spreader ties that give positive tieing and accurate spreading.
11. Construct all forms straight, true, plumb, and square within a tolerance horizontally of one in 200 and tolerance vertically of one in 500.
12. Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.
13. During pour, maintain continuous surveillance to adjust for horizontal and vertical form deflections.

C. Footing Forms: All footing forms shall be wood unless otherwise specifically approved by the Architect.

D. Re-Use of Forms: Re-use of wood forms shall be subject to advance approval of the Owner.

1. Except as specifically approved in advance by the Architect, re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtainable if all forms were new.
2. Except as specifically approved in advance by the Architect re-use of forms shall in no way impart less structural stability to the forms nor less acceptable appearance to finish concrete.
3. Wood forms shall not be re-used where concrete is exposed.

E. Removal of Forms: In general side forms of footings may be removed after structural stability is gained, but surfaces must be coated with curing compound or continuously damp earth.

1. Use all means necessary to protect workmen, passers-by, the installed work and materials of other trades, and the complete safety of the structure.
2. Cut nails and tie wires or form ties off flush, and leave all surfaces smooth and clean.
3. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.
4. Flush all holes resulting from the use of spreader rods and sleeve nuts, using water, and then solidly pack throughout the wall thickness with cement grout applied under pressure by means of a grouting gun, grout shall be one part Portland cement to 2 ½ parts sand, apply grout immediately after removing forms.

END OF SECTION 03100

SECTION 03200 - CONCRETE REINFORCEMENT

1.1 GENERAL

A. Related Work Described Elsewhere:

1,	Placement of other embedded items	Section 03100
2.	Cast-in-place Concrete	Section 03300

B. Qualifications of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this section.

1. Conform with General Notes in Contract Documents.

2. Codes and Standards (latest edition): In addition to complying with all pertinent codes, ACI 318-83 and 2003 International Building Code and regulations, comply with all pertinent recommendations contained in "Manual of Standard Practice for Detailing Reinforced Concrete Structures", publication ACI 315 of the American Concrete Institute, latest edition.
3. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.

C. Shop Drawings: Within 10 days after award of Contract, and before any concrete reinforcement materials are delivered to the job site, submit Shop Drawings to the Architect in accordance with Section 01300 of these Specifications.

1. Do not deliver concrete reinforcement to the job site until receipt of Shop Drawings approval from the Architect.

D. Samples and Certificates: Provide all data and access required for testing as described in Section 01400 of these Specifications.

E. Product Protection: Use all means necessary to protect concrete reinforcement before, during, and after installation, and to protect the installed work and materials of all other trades.

1. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
2. Use all necessary precautions to maintain identification after the bundled are broken.

G. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1. 2 PRODUCTS:

A. Concrete Reinforcement: All concrete reinforcement materials shall be new, free from rust, and complying with the following reference standards:

1. Bars for reinforcement: "Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", ASTM A-615-81, grade 60, unless noted otherwise in general notes.

2. Wire fabric: Specification for Welded Steel Wire Fabric for Concrete Reinforcement ", ASTM A-185.

3. All other materials not specifically described but required for a complete and proper installation of concrete reinforcement shall be as selected by the Contractor subject to the approval of the Architect.

1. 3 EXECUTION:

A. Surface Conditions - Inspection: Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

1. Verify that concrete reinforcement may be installed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the original design.

B. Bending: Fabricate all reinforcement in strict accordance with the approved Shop Drawings.

1. Do not use bars with kinks or bends not shown on the Drawings or on the approved Shop Drawings.
2. Do not bend or straighten steel in a manner that will injure the material.
3. Bend all bars cold.
4. Make bends for stirrups and ties around a pin having a diameter not less than four times the minimum thickness of the bar.
5. Make for other bars, including hooks, around a pin having a diameter not less than six times the minimum thickness of the bar.

C. Placing: Before the start of concrete placement, accurately place all concrete reinforcement positively securing and supporting by concrete blocks, metal chairs and spacers, or by metal hangers.

1. Preserve clear space between bars of not less than the nominal diameter of round bars.
2. In no case let the clear distance be less than 1 2 inch nor less than 1 1/3 times the maximum size of aggregate.
3. Provide the following minimum concrete covering of reinforcement, unless noted otherwise.
4. Concrete below ground deposited against forms — Two (2) inches
5. Concrete deposited against earth — Three (3) inches
6. Slabs on grade with mesh — Two (2) inches
7. Concrete elsewhere as indicated on the drawings or otherwise approved by the architect.

D. Splicing Horizontal Bars: Place bars in horizontal members with minimum laps at splices sufficient to develop the strength of the bars.

1. Bars may be wired together at laps except at points of support of the member, at which points preserve the clear space described above.
2. Wherever possible, stagger the splices of adjacent bars.
3. Splice 48 bar diameters in masonry unless otherwise noted, minimum 1'-6".

E. Splicing wire fabric: Lap all splices in wire fabric at least one mesh wide.

F. Other Splices: Make only those other splices that are indicated on the approved Shop Drawings or specifically approved by the Architect.

G. Placing Dowels: Place all required steel dowels and securely anchor them into position before the concrete is placed.

H. Obstructions: In the event conduits, piping inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Architect and obtain approval of new procedure before placing concrete.

I. Support and Typing: Bars shall be double-loop tied and twisted at each perpendicular intersection with bars in the same plane.

1. All reinforcing shall be supported and adjusted to exact heights before pouring commences.
2. Support footing reinforcing on 2000 PSI concrete block chairs (4" x 4" maximum) or on property protected and anchored metal supports and tie in place.
3. Mesh for slabs on grade shall be continuously hooked up to the slab centerline.

J. Cleaning Reinforcement: Steel reinforcement, at the time concrete is placed around it, shall be free from rust scale, loose mill scale, oil paint, and all other coatings which will destroy or reduce bond between steel and concrete.

K. Protection of Concrete: No aluminum conduit or product containing aluminum or any metal injurious to concrete shall be embedded in concrete.

END OF SECTION 03200

SECTION 03300 - CAST-IN-PLACE CONCRETE

1.1 GENERAL

1. The General Provisions/Conditions and Division One apply to this section.

2. Work Included: Cast-in-place concrete required for this work is indicated on the Drawings and includes, but is not necessarily limited to:

    1. Site concrete work
    2. Footings and foundations
    3. Concrete walls
    4. Slabs on grade
    5. Exterior flat work

3. Related work described elsewhere:

    1. Testing laboratory services: Section 01400
    2. Concrete form work: Section 03100
    3. Concrete reinforcement: Section 03200

4. Qualifications of workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all work performed under this Section.

    1. For finishing of exposed surfaces of the concrete, use only thoroughly trained and experienced journeyman concrete finishers.

E. Codes and Standards (latest edition): Comply with all pertinent recommendations of "Structural Concrete for Building" publication ACI 301, "Recommended practice for measuring, mixing, transporting and placing concrete" ACI 340 of the American Concrete Institute and the 2003 edition of the INTERNATIONAL BUILDING CODE.

    1. Concrete shall be "Ready Mix" type complying with ASTM C94-81 unless a higher standard is called for.
    2. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.

6. Materials List: Within 10 days after award of Contract, and before any concrete is delivered to the job site, submit to the Owner, in accordance with General Conditions of these Specifications, a complete list of all materials proposed to be furnished and installed under this portion of the Work, showing manufacturer's name and catalog number of all items such as admixture and membrane, and the name and address of transit-mix concrete supplier.

G. Transit-mix delivery slips: The following information shall be furnished on each and every delivery ticket for each and every load of ready-mix concrete.

    1. Number of cubic yards.
    2. The exact amount of cement (this can be indicated either by weight or quantity).
    3. The amount of mixing water, including moisture in aggregates (this can be indicated either by weight or quantity).
    4. If water is added at job site, note amount.
    5. Amount of slump in inches.
    6. Type of cement.
    7. Amount of air entrainment (if any) when delivered at job site.
    8. Do aggregates meet ASTM specified--yes or no. Indicated maximum size aggregate.
    9. Amount and brand (or ASTM) of admixture other than air entraining agent (if any).
    10. These tickets shall be given to the resident inspector and if he is not on the job, the superintendent or foreman shall obtain these tickets and see that they are mailed to the

Architect once a week. The foreman shall note location of concrete on job.

11. Keep a record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slip certifying contents of the pour.
12. Make a record available to the Architect and Owner for his inspection upon request.
13. Upon completion of this portion of the Work, deliver the record and the delivery slips to the Architect.
14. Concrete delivered to the site not conforming to the requirements of this Specification will be rejected prior to - during - after placement as applicable without lost responsibility to owner, owner's representative and/or Architect.

8. Protection: Use all means necessary to protect cast-in-place concrete materials before, during, and after installation and to protect the installed work and materials of all other trades.

1. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

1. 2 PRODUCTS:

1. General: All concrete, unless otherwise specifically permitted by the Architect/Engineer, shall be transit-mixed in accordance with ASTM S-94-81.

    1. The control of concrete production shall be under supervision of an approved testing laboratory selected and paid for as described in Section 01350 of these Specifications. This laboratory may inspect batched aggregates and transit-mixed concrete at the mixing plant and distribution plant.

2. Quality Control:

    1. Sampling: ASTM C172
    2. Slump: ASTM C143, minimum one test for each and every load at point of discharge.
    3. Air Content: ASTM C173, minimum one for each set of compressive strength specimens.
    4. All concrete, ASTM C39, minimum one set for each 10 cubic yards or fraction thereof for each class of concrete, shall have the following minimum compressive strength. Test one specimen at 7 days, one specimen at 28 days and retain one for later testing approved by the Architect. Comply with ASTM C31 for making and curing cylinders.

Location of concrete:	Min. psi @ 28 days:	Max. size aggregate:	Max. slump in inches:	Water/Cement Ratio:	Bags:
Footings	3000	1 inch	4	0.50	5-1/2
Foundation walls	4000	1 inch	4	0.45	6-1/2
Building slab on grade:	4000	3/4 inch	4	0.45	6-1/2
Exterior slabs & site work:	4000	3/4 inch	3	0.45	6-1/2

Test results will be reported in writing to the Owner, Architect, Structural Engineer, Contractor and Concrete Producer on same day tests are made.

3. All cement shall be Portland cement conforming to ASTM C-150, type II, low alkali and shall be the product of one manufacturer, the temperature of cement delivered to the plant shall not exceed 150 degrees F.

4. All aggregates shall conform to ASTM C-33-82, uniformly graded as follows:

    1. Flat work: 1/4" minimum to 3/4" maximum
    2. All other: 1/4" minimum to 1" maximum

5. Coarse aggregate shall be crushed with a minimum of three (3) crushed faces and a minimum cleanliness value of 75%. It shall be composed of hard rocks containing no more than 10% shale or other soft materials. No measurable amount of included alkali will be acceptable.

6. Fine aggregate shall contain a minimum of 75% sharp, washed sand. Sand shall pass a 3/8" sieve and be graded coarse to fine.

7. All water shall be clean and free from deleterious matter, drinkable.

8. Air-Entraining Admixture: ASTM C 260-77. 6-1/2% +/- 1-1/2% for 3/4" aggregate.

9. Water Reducing Admixture: ASTM C494-81. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable. Do not use calcium chloride.

   a. Fly Ash Will Not Be Allowed

10. Concrete floor seal after cleaning on existing and new floors: Rusteleum 6010-408 floor seal.

    a. Floor seal is not required where finished flooring is shown.

11. Membrane-Forming Curing Compound: ASTM C309-81, Type I.

12. Joint Fillers: See Division 7.

13. All other materials not specifically described but required for a complete and proper installation of cast-in-place concrete shall be as selected by the Contractor subject to the approval of the Architect.

1. 3 EXECUTION:

A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

   1. Verify that all items to be embedded in concrete are in place.
   2. Verify that concrete may be placed to the lines and elevations indicated on the Drawings with all required clearance from reinforcements.

B. Discrepancies: In the event of discrepancy, immediately notify the Owner.

   1. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

C. PREPARATION: Remove all wood scraps and debris from the areas in which concrete will be placed.

   1. Thoroughly clean the areas to ensure proper placement and bonding of concrete.
   2. Thoroughly wet the forms (except in freezing weather), or oil them, remove all standing water.
   3. Thoroughly clean all transporting and handling equipment.

D. Notification: Notify the Architect at least 48 hours before placing concrete and do not commence pours in inspector's absence unless granted permission from him. Place all concrete in forms within 1 hour after water added to mix.

E. Concrete Placing Method: Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials.

   1. For chuting, pumping, and pneumatically conveying concrete, use only equipment of such size and design as to ensure a practically continuous flow of concrete at the delivery end without loss or separation of materials.
   2. Do not overwork concrete nor allow water to sit on the surface.

3. Do not dust the surface with cement.
4. Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed. Place all embedded items. Place all concrete within 1 2 hours after water is added to mix.
5. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is work around reinforcement and other embedded items and into all parts of forms. Do not use "gandy" or similar type tool on slabs. Maintain spare vibration on job. Do not vibrate forms or reinforcing.
6. Do not use retempered concrete or concrete that has been contaminated by foreign materials.

F. Make and locate construction joints so as to not impair the strength of the structure.

1. Place isolation and control joints in slabs, on-ground to stabilize differential settlement and random cracking.
2. Obtain the Architect's approval of location of all construction joints and control joints in the Work prior to start of concrete placement.

G. Finishing: Unless otherwise indicated on the Drawings, make all slabs even and uniform in appearance and where no slope is required, level within plus or minus 1/8 inch in ten feet.

1. Where floor drains or floor slopes are indicated, slope slabs uniformly to provide even fall for drainage, floors must completely drain.
2. Trowel all interior slabs to a smooth, hard finish, free of trowel marks, for seal or resilient floor covering.
3. Apply floor sealing agent in accordance with manufacturer's recommendations.

H. Exterior Surface Finishes: Where "broom finish" is indicated on the Drawings, and where no other exterior slab finish is indicated on the Drawings, finish the exposed concrete surface by lightly combing with a medium stiff broom, after light troweling is completed, perpendicular to the direction of traffic.

1. Do not dust with Portland cement or work excessive fines to surface.
2. Exposed foundation wall shall have a rubbed finish free of form. Patch any honeycomb (where allowed) and fill tie holes. Color is to match. Cure patching per PCA recommendations.

3. Cure all interior slabs by fog mist until curing membrane has been installed.

4. Immediately upon finishing a slab area, apply a fog mist above the finished concrete surface, using fog nozzles of a type approved by Architect to keep the air humid and to prevent loss of moisture from the concrete surface.
5. Provide an appearance of wet sheen on the concrete but do not permit concentration of water in one place. Do not dust with cement or work excessive lines to surface.
6. Continue fogging until membrane has been installed, minimum 7 days.

I. Concrete floor seal shall be applied to all interior concrete slabs to be left exposed and the exterior concrete surfaces of the loading ramp and lube rack.

J. Membrane-Forming Curing Compound shall be applied to all exterior concrete slabs.

K. HOT WEATHER REQUIREMENTS: Comply with ACI 306R-78.

1. Do not use concrete with a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints.
2. Provide and use all required windbreaks, fog sprays, and other devices to protect the concrete.

L. COLD WEATHER REQUIREMENTS: Comply with ACI 305R-77.

1. Do not place concrete on earth when frost is present. Do not place in forms until all frost is

melted from forms and reinforcing.

2. If any concrete shows any evidence of freezing, such as sanding, flaking, or crumbing, the Owner can require all of that concrete to be replaced at no extra cost or extension of completion date.
3. Protection methods and materials shall be approved by Architect.
4. Below grade, manufactured insulating blankets are permissible for freeze protection above 25 degrees F outside ambient.
5. Immediately after forms and curing membranes have been removed, inspect all concrete surfaces and patch all pour joints, voids, rock pockets, form tie holes, and other imperfections before the concrete is thoroughly dry.
6. Do not patch until concrete has been inspected by the Architect.

M. Patching Minor Defective Areas: Upon approval of Architect, chip away to a depth of about one inch, leaving edges perpendicular to the surface, wet the area to be patched and a space of at least six (6) inches wide around it to prevent water being absorbed out of the mortar.

1. Coat the area to be patched with cement wash consisting of neat cement and a solution of one part "Konset", or equal approved by the Architect, to four parts of water; apply the patching mortar immediately.
2. Patching mortar shall consist of one part cement to three parts water, to a consistency as dry as possible within the requirements of handling and placing; thoroughly compact the mortar by ramming it into place.
3. Screed off so as to leave the patch lightly higher than surrounding surfaces; leave undisturbed for a period of one to two hours to permit initial shrinkage, and then perform final finishing.
4. Finish the patch to match adjacent surfaces and keep wet for at least three (3) days, provide and install required protective covering.

N, Patching Major Defective Areas: (where allowed by the Architect). If the defects are serious or affect the strength of the structure, or if patching does not satisfactorily restore the quality and appearance of the surface, Architect may require "cement gun concrete" to be used or the concrete to be removed and replaced complete in accordance with the provisions of this Section; all at no additional cost to the Owner.

O. TWO (2) YEAR WRITTEN GUARANTEE: Provide to OWNER a two year written guarantee, in a form approved by the Architect, at the Contractor's expense. Promptly remove and/or replace defective concrete occurring within two years after date of "substantial completion" at Contractor's expense, and as directed by Owner. Spalling, pitting and cracking of concrete shall be considered defective work.

END OF SECTION 03300

SECTION 05120 - STRUCTURAL STEEL

1.1 GENERAL

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

C. Submittals: In addition to Product Data and mill test reports on structural steel and bolts, submit Shop Drawings detailing fabrication of structural steel components, including connections, splices, holes, welds, and bolts.

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
2. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
3. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification in the last 12 months.

F. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

1.2 PRODUCTS

A. Structural Steel Shapes, Plates, and Bars: ASTM A 36 (ASTM A 36M), carbon steel.

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Anchor Rods, Bolts, Nuts: ASTM A 36 (ASTM A 36M), unheaded rods.

D. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.

F. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

G. Nonmetallic, Shrinkage-Resistant Grout: Premixed, ASTM C 1107, of consistency suitable for application.

H. Fabrication: Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
2. Shop install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.3. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

    a. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

4. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work. Welders shall be currently certified in accordance with AWS requirements within the 12 months of performance of the work. Also conform with the requirements included in the General Notes on the Drawings.

I. Shop Priming: Shop prime steel, except surfaces embedded in concrete or mortar, surfaces to be field welded, surfaces to be high-strength bolted with slip-critical connections, and surfaces to receive sprayed-on fireproofing. Apply prime paint to provide a minimum dry film thickness on 2.0 mils.

1. Surface Preparation: SSPC-SP 2 "Hand Tool Cleaning" or SSPC-SP 3 "Power Tool Cleaning."
2. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1.3 EXECUTION

A. Erect structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates and set on wedges, shims, or setting nuts as required.

1. Tighten anchor bolts, cut off wedges or shims flush with edge of base or bearing plate, and pack grout solidly between bearing surfaces and plates.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.

E. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

F. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

G. Shop and Field Quality Control: Owner will engage an independent testing and inspecting agency to perform shop and field inspections and tests and to prepare test reports.

1. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
2. Additional testing, at Contractor's expense, will be performed to determine compliance of

corrected Work with specified requirements.

3. High-strength bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
4. In addition to visual inspection, welded connections will be inspected and tested according to AWS D1.1 procedures.

END OF SECTION 05120

SECTION 05500 - METAL FABRICATIONS

1.1 GENERAL

A. Submittals: In addition to Product Data, submit the following:

1. Shop Drawings detailing fabrication and erection.
2. Templates for anchor bolts.
3. Samples for each type of extruded nosing and tread.

1.2 PRODUCTS

A. General: Provide materials with smooth, flat surfaces without blemishes.

B. Ferrous Metals: As follows:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
3. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless otherwise indicated. Pipe bollard size as shown on drawings minimum 8-inch diameter.

C. Aluminum: As follows:

1. Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.

D. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664 and compatible with finish paint systems indicated.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Fasteners: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

H. Fabrication, General: Use connections that maintain structural value of joined pieces. Shear and punch metals cleanly and accurately. Remove burrs.

1. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

I. Loose Bearing and Leveling Plates: Provide for steel items bearing on masonry or concrete. Drill plates to receive anchor bolts.

1. Galvanize plates.

J. Loose Steel Lintels: Fabricate from shapes and to sizes indicated.

K. Stair Railing: Brackets: Factory finished chrome plated steel.

L. Miscellaneous Framing and Supports: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work. Fabricate from structural steel of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.

M. Miscellaneous Steel Trim: Fabricate units with continuously welded joints and smooth exposed edges. Miter corners and use concealed splices where possible. Provide cutouts, fittings, and anchorages; coordinate assembly and installation with other work.

N. Finish metal fabrications after assembly. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Shop prime ferrous-metal items not indicated to be galvanized.

1. Hot-dip galvanize items indicated to be galvanized to comply with ASTM A 123 or ASTM A 153/A 153M as applicable.
2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
3. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1.3 EXECUTION

A. Installation, General: Provide anchorage devices and fasteners for securing metal fabrications to in-place construction. Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.

1. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
2. Fit exposed connections accurately together. Weld connections, unless otherwise indicated. Do not weld, cut, or abrade galvanized surfaces.

B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack with nonshrink, nonmetallic grout.

C. Touch up shop paint after erection. Clean field welds, bolted connections, and abraded areas and paint with the same material as used for shop painting.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

1.1 GENERAL

A. Submittals: Submit the following:

1. Product Data for engineered wood products, underlayment, insulating sheathing, air-infiltration barriers, metal framing anchors, and construction adhesives.
2. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses.
3. Wood treatment data, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials.
4. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence code compliance of engineered wood products, foam-plastic sheathing, air-infiltration barriers, metal framing anchors, power-driven fasteners, and fire-retardant-treated wood.

1.2 PRODUCTS

A. Lumber, General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review. Provide dressed lumber, S4S, with each piece factory marked with grade stamp of inspection agency.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Wood-Preservative-Treated Materials: Comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

    a. Wood, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
    b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
    c. Wood floor plates installed over concrete slabs directly in contact with earth.

2. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

C. Dimension Lumber: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

1. Non-Load-Bearing Interior Partitions: Provide Standard, Stud, or No. 3 grade and any of the following species:

    a. Species: Western woods; WCLIB or WWPA.

2. Framing Other than Non-Load-Bearing Partitions: Provide any species and grade with a modulus of elasticity of at least 1,300,000 psi (8950 MPa) and an extreme fiber stress in bending of at least 850 psi (5.9 MPa) for 2-inch nominal (38 mm-actual) thickness and 12-inch nominal (286-mm actual) width for single member use.

D. Miscellaneous Lumber: Provide No. 3 or Standard grade lumber of any species for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, and similar members.

E. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project. Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

F. Wood-Based Structural-Use Panels: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.

1. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.
2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."
3. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, 5/8-inch sub floor. ¾" wall protection wainscot.

G. Particleboard: Comply with and factory mark each panel according to ANSI A208.1. Provide thickness indicated.

1. Particleboard Underlayment: Grade PBU.

H. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

1. Power-Driven Fasteners: CABO NER-272.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

I. Metal Framing Anchors: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.
3. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (ASTM A 653M, Z180) coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

J. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

1.3 EXECUTION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

B. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
2. Published requirements of metal framing anchor manufacturer.3. "Table 23-I-Q--Nailing Schedule" of the Uniform Building Code.

D. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

E. raming Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

F. Installation of Structural-Use Panels: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions of above-referenced guide.
2. Fastening Methods: Fasten panels as indicated below:

a. Sheathing: Nail or staple to framing.

END OF SECTION 06100

SECTION 06200 - FINISH CARPENTRY

1.1 GENERAL

A. Submittals: In addition to Product Data, submit Samples for each finish and type of siding and paneling.

1.2 PRODUCTS

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Interior Standing and Running Trim: Provide finished lumber and moldings complying with the following requirements:

1. Species and Grade Softwood: C Select, eastern white pine; NELMA or B & Btr. Select or Supreme, Idaho white, lodgepole, ponderosa, or sugar pine; WWPA.
2. Harwood: Red Oak.

C. Wood Molding Patterns: Provide stock moldings made to patterns included in WMMPA WM 7 and graded under WMMPA WM 4.

1. WM 366 (featheredge casing).
2. Moldings for Painted Finish: P-Grade.
3. Hardwood Trim: As shown on drawings.
4. Stair Railings: Minimum 1 ¼-inch diameter paint grade Oak.

1.3 EXECUTION

A. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours.

B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

C. Standing and Running Trim: Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.

D. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

END OF SECTION 06200

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes interior woodwork including for the following applications:

1. Standing and running trim.
2. Plastic-laminate cabinets.
3. Plastic-laminate countertops.

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips, unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Cabinet hardware and accessories.
2. Finishing materials and processes.

B. Shop Drawings: Include location of each item, plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Plastic-laminate-clad panel products, for each type, color, pattern, and surface finish.
2. Thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of woodwork.

B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood Products:

1. Softwood Plywood: DOC PS 1, Medium Density Overlay.

B. Thermoset Decorative Overlay: Particleboard or medium-density fiberboard with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

C. High-Pressure Decorative Laminate: NEMA LD 3.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Formica Corporation.
b. International Paper; Decorative Products Div.
c. Laminart.
d. Pioneer Plastics Corp.
e. Westinghouse Electric Corp.; Specialty Products Div.
f. Wilsonart International; Div. of Premark International, Inc.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials for a complete installation of architectural woodwork, except for items specified in Division 8 Section "Door Hardware."

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

D. Exposed Hardware Finishes: Complying with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

2.4 FABRICATION

A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Interior Woodwork Grade: Custom complying with the referenced quality standard.
2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs.
3. Seal edges of openings in countertops with a coat of varnish.

B. Plastic-Laminate Cabinets:

1. AWI Type of Cabinet Construction: Flush overlay.
2. Reveal Dimension: 1/2 inch (13 mm).
3. Laminate Cladding for Exposed Surfaces: High-pressure decorative of grade indicated.

a. Horizontal Surfaces Other Than Tops: HGS.
b. Postformed Surfaces: HGP.
c. Vertical Surfaces: HGS.
d. Edges: PVC T-mold matching laminate in color, pattern, and finish.

4. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS, High-pressure decorative laminate, Grade CLS, or Thermoset decorative overlay.

a. Drawer Sides and Backs: Solid-hardwood lumber.
b. Drawer Bottoms: Thermoset decorative overlay.

5. Colors, Patterns, and Finishes: As selected from manufacturer's full range.

C. Plastic-Laminate Countertops:

1. High-Pressure Decorative Laminate Grade: HGS.
2. Colors, Patterns, and Finishes: As selected from manufacturer's full range.
3. Edge Treatment: Same as laminate cladding on horizontal surfaces.
4. Core Material at Sinks: Particleboard, on medium density fiberboard made with exterior glue, or exterior-grade plywood.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Condition woodwork to average prevailing humidity conditions in installation areas and examine and complete work as required, including removal of packing and backpriming before installation.

B. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in this Section for type of woodwork involved.

C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim as required with concealed shims.

D. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips, No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

END OF SECTION 06402

SECTION 07160 - BITUMINOUS DAMPPROOFING

1.1 GENERAL

A. Submittals: Submit product data for each type of product specified, including data substantiating that materials comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Apply to compressor building foundation walls.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or as approved by Architect in accordance with DIVISION 1:

1. Cold-Applied, Asphalt Emulsion Dampproofing:

a. ChemRex, Inc.; Sonneborn Building Products Div.
b. Euclid Chemical Co.
c. Karnak Chemical Corporation.
d. Koppers Industries, Inc.
e. Meadows: W.R. Meadows, Inc.

B. Bituminous Dampproofing, General: Provide products recommended by manufacturer for designated application.

1. Odor Elimination: Provide material warranted by manufacturer to be odor free after drying for 24 hours under normal conditions.

C. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing.

1. Spray Grade: Emulsified asphalt complying with ASTM D 1227, Type III.

D. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

E. Protection Course, Board Type: Premolded, 1/8-inch- (3-mm-) thick, multi-ply, semirigid board, with a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt and faced on one side with polyethylene film.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Protection Course II; ChemRex, Inc.; Sonneborn Building Products Div.
b. Bituthene Asphaltic Hardboard; Grace: W.R. Grace & Co.
c. PC-2 Protection Course; Meadows: W.R. Meadows, Inc.

1.3 EXECUTION

A. Preparation: Clean substrate and comply with recommendations of prime materials manufacturer.

1. Fill voids, seal joints, and apply bond breakers as recommended by prime materials manufacturer.
2. Install separate flashings and corner protection stripping as recommended by prime materials manufacturer.
3. Prime substrate as recommended by prime materials manufacturer.
4. Protection of Other Work: Prevent spillage and migration onto other surfaces of adjoining work.

B. Application: Apply dampproofing where indicated on Drawings. Apply 1 or 2 coats as recommended by manufacturer.

1. Reinforcement: At changes in plane or as shown, install lapped course of glass fabric in first coat of dampproofing compound.
2. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is completed.

C. Cold-Applied, Asphalt Emulsion Dampproofing: Apply on either exterior or interior surfaces.

1. Spray Grade: Apply at a rate of 1.5 to 2.5 gal./100 sq. ft. (0.6 to 1 L/sq. m), to produce a uniform, dry-film thickness of not less than 15 mils (0.4 mm). Apply in 2 coats, if necessary, to obtain required thickness, allowing time for complete drying between coats.

D. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

E. Protection Course: Comply with dampproofing materials manufacturer's recommendations for method of support or attaching of protection materials. Support with spot application of trowel-grade mastic where not otherwise indicated.

END OF SECTION 07160

SECTION 07210 - BUILDING INSULATION

1.1 GENERAL

A. Submittals: Product Data for each type of insulation product specified.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated as determined by testing identical products per ASTM E 84, ASTM E 119, or ASTM E 136 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.2 PRODUCTS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Faced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III, Class A (blankets with reflective vapor-retarder membrane facing and flame spread of 25 or less); with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

1. Mineral-Fiber Type: Fibers manufactured from glass.
   a. Minimum R-13 (high density) for walls.
   b. Minimum R-22 (high density) for roof.

C. Eave Ventilation Troughs: Preformed rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

1.3 EXECUTION

A. Installation, General: Comply with insulation manufacturer's written instructions applicable to products and application indicated.

1. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
2. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
3. Apply single layer of insulation to produce thickness indicated.

B. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 07210

SECTION 07411 - MANUFACTURED ROOF AND WALL PANELS

1.1 GENERAL

A. Submittals: In addition to Product Data, submit Shop Drawings, installation instructions, color samples, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide panels by one of the following or as approved by the Architect prior to bidding:

1. Steel Panels:
   a. American Buildings Roofing and Architectural Products.
   b. Architectural Building Components.
   c. Berridge Manufacturing Co.
   d. Carlisle Engineered Metals.
   e. Fabral/Gentec Building Products, Inc.
   f. Flexospan, Inc.
   g. Innovative Metals Co., Inc.
   h. K-Metals, Inc.
   i. Metal Building Components, Inc.
   j. Metal Sales Mfg. Corp.
   k. Modern Metal Systems, Inc.
   l. Perma-Clad Products, Inc.
   m. Robertson: H.H. Robertson Company.
   n. Steelox Roofing Systems, Inc.

B. Steel Panels: Structural-quality steel sheet galvanized according to ASTM A 653, G90 (ASTM A 653M, Z275); 0.034 inch (0.85 mm) thick, unless otherwise indicated.

1. Finish: Coil coated with 2-coat fluoropolymer according to ASTM A 755 (ASTM A 755M), composed of inhibitive primer and color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 0.9 mil (0.023 mm); in color as selected by Architect from manufacturer's full range of colors.

2. Profile as shown on the drawings. Gage of panel as determined by the span - minimum 20 gage.

C. Lap-Seam Roof Panel Assembly: Designed for mechanical attachment of panels to roof purlins or deck using exposed fasteners and sealants.

D. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

E. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam strips.

F. Sealing Tape: Pressure-sensitive, polyisobutylene tape with release paper backing.

1.3 EXECUTION

A. Examination: Examine substrates and conditions for compliance with requirements indicated for conditions affecting performance of metal panel roofing. Examine roof framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer. Do not proceed with roof panel

installation until unsatisfactory conditions have been corrected.

B. Panel Installation: Comply with panel manufacturer's written instructions and recommendations for installation. Anchor panels securely in place, with provisions for thermal and structural movement. Field cutting exterior panels by torch is not permitted. Install panels with concealed fasteners, unless otherwise indicated.

C. Accessories: Install components required for a complete roof panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, flashings, gutters, down spouts, sealants, gaskets, fillers, closure strips, and similar items.

D. Separate dissimilar metals with a bituminous coating, rubberized-asphalt underlayment, or by other means recommended by manufacturers of dissimilar metals.

E. Weatherproofing: Install gaskets, joint fillers, and sealants where required for weatherproof performance of panel assemblies as recommended by panel manufacturer. Seal panel end laps and side joints as recommended by panel manufacturer. Install weatherseal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

1. Lap-Seam Roof Panels: Provide sealant tape at lapped joints of ribbed or fluted panels and between panels and protruding equipment, vents, and accessories. Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.

F. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

G. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 07411

SECTION 07600 - FLASHING AND SHEET METAL

1.1 - GENERAL

A. Conform to profiles and sizes shown, and comply with "Architectural Sheet Metal Manual" by SMACNA, for each general category of work required.

1. Metal flashing and counter flashing - provide with Section 07411
2. Gutters and Downspouts - provide with Section 07411
3. Color for all exposed flashing, gutters and downspouts, and trim to be selected by Architect from a minimum twelve color pallet to be provided as typical colors available from manufacturer. Note that a minimum of two colors will be used for this project.

1.2 - PRODUCTS

A. Galvanized Steel Sheet: Hot-dip zinc-coated steel sheet complying with ASTM A 446 with G90 coating complying with ASTM A 525, Grade C or to suit manufacturer's standards.

1. Provide sheet manufacturer's standard smooth sheet finish.

B. Fluoropolymer Coating: Manufacturer's standard two-coat, thermo-cured, full-strength 70 percent "Kynar 500" coating consisting of a primer and a minimum 0.75-mil dry film thickness with a total minimum dry film thickness of 0.9 mil and 30 percent reflective gloss when tested in accordance with ASTM D 523.

C. Durability: Provide coating that has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of No. 8 in accordance with ASTM D 659; and without fading in excess of 5 NBS units.

1. Metal flashing and counter flashing - 24 gauge minimum
2. Gutters and Downspouts - 26 gauge minimum

D. Fabricate sheet metal with flat-lock seams; solder with type solder and flux recommended by manufacturer.

E. Coat back-side of fabricated sheet metal with 15-mil sulfur-free bituminous coating, FS TT-C-494 or SSPC-Paint 12, where required to separate metals from corrosive substrates including cementitious materials, wood or other absorbent materials; or provide other permanent separation.

F. Provide for thermal expansion of running sheet metal work, by overlaps or expansion joints in fabricated work. Where required for water-tight construction, provide hooked flanges filled with polyisobutylene mastic for 1" embedment of flanges. Space joints at intervals of not more than 50' for steel.

1.3 - EXECUTION

A. Installation Requirements:

1. Anchor work in place with noncorrosive fasteners, adhesives, setting compounds, tapes and other materials and devices as recommended by manufacturer of each material or system. Provide for thermal expansion and building movements. Comply with recommendations of "Architectural Sheet Metal Manual" by SMACNA.

2. Seal moving joints in metal work with elastomeric sealants, complying with FS SS-T-00227, -00230, or 001543.

B. Clean metal surfaces of soldering flux and other substances which could cause corrosion.

C. Nail flanges of expansion joint units to substrates in accordance with manufacturer's recommendations.

D. Composition Stripping: Cover flanges (edges) of work set on bituminous substrate with 2 courses of glass fiber fabric (ASTM D 1668) set in and covered with roofing cement, FS SS-C-153.

E. Performance: Water-tight/weatherproof performance of flashing and sheet metal work is required.

END OF SECTION 07600

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

1.1 GENERAL

A. Performance Requirements: Provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
    a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
    b. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
    c. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

B. Submittals: In addition to Product Data for each type of product specified, submit the following:

1. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction.
2. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
3. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the requirements of the Uniform Building Code and the office of the Utah State Fire Marshal.

1.2 PRODUCTS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
1. A/D Fire Protection Systems Inc.
2. DAP Inc.
3. Firestop Systems Inc.
4. Hilti Construction Chemicals, Inc.
5. Instant Firestop Mfg. Inc.
6. International Protective Coatings Corp.
7. Isolatek International.
8. Nelson Firestop Products.
9. NUCO Industries.
10. RectorSeal Corporation (The).
11. Specified Technologies Inc.
12. 3M Fire Protection Products.
13. Tremco.
14. United States Gypsum Company.

B. Firestopping, General: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated

by through-penetration firestop system manufacturer based on testing and field experience.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Paragraph. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

1.3 EXECUTION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Paragraph and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

END OF SECTION 07841

SECTION 07920 - JOINT SEALANTS

1.1 GENERAL

A. Preconstruction Joint-Sealant-Substrate Tests: Submit substrate materials, representative of actual joint surfaces, to joint sealant manufacturer for laboratory testing of joint sealants for adhesion to primed and unprimed substrates and for compatibility with joint substrates and other joint-related materials.

B. Submittals: In addition to Product Data, submit the following:

1. Samples of each type and color of joint sealant required.
2. Test reports for joint sealants evidencing compliance with requirements.

1.2 PRODUCTS

A. Elastomeric Sealant Manufacturers: Subject to compliance with requirements, provide sealants by one of the following:

1. Silicone Sealants:
   a. Bostik Inc.
   b. Dow Corning.
   c. GE Silicones.
   d. NUCO Industries, Inc.
   e. Ohio Sealants, Inc.
   f. Pecora Corporation.
   g. Polymeric Systems, Inc.
   h. Sonneborn Building Products Div., ChemRex Inc.
   i. Tremco.

B. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.

C. Colors: Provide colors indicated for exposed joint sealants or, if not indicated, as selected by Architect from manufacturer's full range for this characteristic.

D. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant of base polymer specified below:

1. Medium-Modulus Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; with the additional capability, when tested per ASTM C 719, to withstand 50 percent movement in both extension and compression for a total of 100 percent movement and still comply with other requirements of ASTM C 920; and as follows:
   a. Uses NT, M, G, A, and O.

E. Acrylic-Based Solvent-Release Sealant: ASTM C 1311.

F. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

G. Sealant Backings, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

H. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of

joint.

I. Primer: As recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

1.3 EXECUTION

A. General: Comply with joint sealant manufacturer's instructions for products and applications indicated.

B. Sealant Installation Standard: Comply with ASTM C 1193.

C. Acoustical Sealant Application Standard: Comply with ASTM C 919 for use of joint sealants in acoustical applications.

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

1.1 GENERAL

A. Submit Product Data for each type of door and frame specified.

B. Quality Assurance: Comply with ANSI/SDI 100.

C. Fire-Rated Door Assemblies: NFPA 80, identical to assemblies tested per ASTM E 152, and labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or as approved by Architect in accordance with DIVISION 1:

1. Allied Steel Products, Inc.
2. Amweld Building Products, Inc.
3. Ceco Door Products.
4. Curries Co.
5. Fenestra Corp.
6. Pioneer Industries.
7. Republic Builders Products.
8. Steelcraft.

B. Hot-Rolled Steel Sheets: ASTM A 569 (ASTM A 569M).

C. Cold-Rolled Steel Sheets: ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality.

D. Galvanized Steel Sheets: ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, with A 60 or G 60 (Z 180 or ZF 180) coating designation, mill phosphatized.

E. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:

1. Interior Doors: Grade II, heavy-duty, Model 2, seamless design, minimum 0.0478-inch- (1.2-mm-)(18 gage) thick cold-rolled steel sheet faces.
2. Exterior Doors: Grade III, extra heavy-duty, Model 2, seamless design, minimum 0.0635-inch- (1.6-mm-)(16 gage) thick galvanized steel sheet faces.

F. Frames: Provide frames for doors, sidelights, borrowed lights, and other openings that comply with ANSI/SDI 100; fabricate to be rigid, neat in appearance, and free from defects, warp, or buckle.

1. For interior frames provide units with mitered or coped and continuously welded corners, formed from 0.0478-inch- (1.2-mm-)(18 gage) thick cold-rolled steel for openings 48 inches (1220 mm) or less in width and from 0.0598-inch- (1.5-mm-)(16 gage) thick steel for openings over 48 inches (1220 mm) in width.
2. For exterior frames provide units with mitered or coped and continuously welded corners, formed from 0.0635-inch- (1.6-mm-)(14 gage) thick galvanized steel sheet.
3. Door Silencers: 3 on strike jambs of single-door frames and 2 on heads of double-door frames.
4. Plaster Guards: Provide where mortar might obstruct hardware operation and to close off interior of openings.
5. Grout: As specified in Division 4 Section "Unit Masonry."

G. Tolerances: Comply with SDI 117.

H. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to SDI 107.

J. Finishes, General: Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

1. Apply primers and organic finishes to doors and frames after fabrication.

K. Galvanized Steel Sheet Finishes: Comply with SDI 112 and the following:

1. Surface Preparation: Clean surfaces with non-petroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified to comply with ASTM A 780.
2. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight.
3. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.

a. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

L. Steel Sheet Finishes: Comply with SSPC-PA 1, "Paint Application Specification No. 1."

1. Surface Preparation: Solvent-clean surfaces according to SSPC-SP 1. Remove mill scale and rust to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
2. Pretreatment: Immediately after surface preparation, apply a conversion coating suited to organic coating applied over it.
3. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

1.3 EXECUTION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.

1. Install at least 3 anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.
2. Install fire-rated frames according to NFPA 80.

C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
2. Finish Hardware is specified in Section 08711.
3. Smoke-Control Doors: Comply with NFPA 105.

D. Prime Coat Touch up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply Touch up of compatible air-drying primer.

E. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08361 - SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes electrically operated sectional overhead doors.

B. See Division 5 Section "Metal Fabrications" for miscellaneous steel supports.

C. See Division 16 Sections for electrical service and connections for powered operators and accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
2. Air Infiltration: Maximum Rate: 0.08 cfm (0.038 L/s) at 15 mph (24 km/h).
3. Impact Test for Flying Debris: Comply with ASTM E 1996, tested according to ASTM E 1886.

a. Level of Protection: Basic Protection.
b. Wind Zone One**:** 110 mph (176 km/h)**,** pressure test to 3/4 and 1-1/2 x design pressure (positive and negative).

B. Operation-Cycle Requirements: Provide sectional overhead door components and operators capable of operating for not less than 10,000 cycles.

1.3 SUBMITTALS

A. Product Data: For each type and size of sectional overhead door and accessory.

B. Shop Drawings: For special components and installations not detailed in manufacturer's product data.

C. Samples: For each exposed finish.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Doors with Steel Panels:

a. Amarr Garage Doors.
b. Arm-R-Lite.
c. Clopay Building Products Company; a Griffon Company.
d. Fimbel Door Corporation.
e. General American Door Company.
f. Haas Door; a Nofziger Company.
g. Martin Door Manufacturing.
h. Overhead Door Corp.
i. Raynor.
j. Wayne-Dalton Corp.
k. Windsor Door; a MAGNATRAX Corporation.

2.2 STEEL DOOR SECTIONS

A. Construct door sections including face sheets and frames from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, coating designation.

1. Exterior-Section Face: Manufacturer's standard ribbed.

B. Fabricate door panels from a single sheet to provide sections not more than 24 inches (600 mm) high and nominally 2 inches (51 mm) deep.

1. For Insulated Doors: Thermal-break construction.

C. Enclose open sections with channel end stiles formed from not less than 0.064-inch- (1.6-mm-) thick galvanized steel sheet and weld end stiles to door section in place.

D. Reinforce bottom section with a continuous channel or angle complying with bottom-section profile and allowing installation of astragal.

E. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

F. Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean galvanized surfaces so surfaces are free of oil and other contaminants.

a. Pretreat zinc-coated steel, after cleaning, with a conversion coating.

2. Apply manufacturer's standard primer to both door faces after forming.
3. Apply manufacturer's standard primer to interior- and exterior-door faces after forming.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized steel track system, sized for door size and weight, designed for lift type indicated and clearances shown, including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Weld or bolt to track supports.

1. Provide tracks configured for the following lift types:

a. Vertical.

2. Track Reinforcement and Supports: Galvanized steel supporting members to provide strength and rigidity during opening and closing of doors.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of overhead door.

1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
2. Provide continuous flexible seals at door jambs for a weathertight installation.

2.4 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware to suit door type.

B. Hinges: Heavy-duty galvanized steel hinges at each end stile and at each intermediate stile. Attach hinges to door sections through stiles and rails. Provide double-end hinges where required and for doors exceeding 16 feet (4.87 m) in width.

C. Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races.

1. Tire Material: Case-hardened steel.

D. Push/Pull Handles: Galvanized steel lifting handles on each side of door.

E. Slide Bolt: Engage through slots in tracks for locking by padlock, operable from inside only.

F. Locking device assembly with lock, dead bolt, operating handle, and adjustable locking bar to engage through slots in tracks.

1. Locking Bars: Single-jamb side operable from inside and outside.
2. Lock cylinder is specified in Division 8 Section "Door Hardware."

G. Chain Lock Keeper: Suitable for padlock.

H. If door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

2.5 COUNTERBALANCE MECHANISM

A. Extension Spring: Oil-tempered wired springs with internal safety rods. Combine operation with a spring bumper in each horizontal track to cushion door at end of opening operation.

B. Torsion Spring: Fabricated from oil-tempered-steel wire, mounted on a cross-header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated for a minimum of 10,000 cycles.

C. Cable Drums: Cast-aluminum or gray-iron casting cable drums grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft.

D. Cable Safety Device: Include a spring-loaded, steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level shaft and prevent sag.

F. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, and accessories required for proper operation.

B. Disconnect Device: Hand-operated disconnect device for automatically engaging chain-and-sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect device and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Provide control equipment, maximum 24-V, ac or dc.

D. Door-Operator Type: Unit consisting of electric motor, trolley or drawbar type, and floor-level quick release for manual operation.

E. Electric Motors: High-starting torque, reversible, continuous-duty, with overload protection, sized to start, accelerate, and operate door in either direction from any position.

1. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.

F. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

G. Obstruction Detection Device: Automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.

H. Limit Switches: Adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware according to Shop Drawings, manufacturer's written instructions, and as specified.

3.2 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup services.

3.3 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

B. Touch-up Painting: Immediately after welding galvanized track to track supports, clean field welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional overhead doors.

END OF SECTION 08361

SECTION 08520 - ALUMINUM WINDOWS

1.1 GENERAL

A. This Section includes Heavy Commercial aluminum windows of the HC40 performance class.

B. Performance Requirements: Provide windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.

C. Testing shall demonstrate compliance with requirements indicated in AAMA 101 for air infiltration, water penetration, and structural performance for type, grade, and performance class of windows required. Where required design pressure exceeds the minimum for the specified window grade, comply with AAMA 101, Section 3, "Optional Performance Classes."

D. Test Criteria: Testing shall be performed by a qualified independent testing agency based on the following criteria:

1. Design wind velocity at Project site is 70 mi./h (113 km/h), Expos “B”.
2. Test Procedures - minimum requirements: Test window units according to ASTM E 283 for air infiltration, ASTM E 547 for water penetration, and ASTM E 330 for structural performance.

E. Submittals: Submit the following:

1. Product Data for each type of window required, including construction details and fabrication methods; profiles and dimensions of individual components; data on hardware, accessories, and finishes. Include recommendations for maintaining and cleaning exterior surfaces.
2. Shop Drawings showing fabrication and installation of each type of window required. Include layout and installation details, elevations at 1/4 inch = 1 foot (1:50) scale, typical window unit elevations at 3/4 inch = 1 foot (1:20) scale, and full-size section details of typical composite members.
3. Samples for initial color selection on 12-inch- (300-mm-) long sections of window members. Where finishes involve normal color variations, include Sample sets showing the full range of variations expected.
4. Test reports from a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated. Test results based on use of down-sized test units will not be accepted.

F. Product Options: The Drawings indicate sizes, profiles, dimensional requirements, and aesthetic effects of aluminum windows and are based on the specific window types and models indicated. Other aluminum window manufacturers whose products have equal performance characteristics may be considered provided deviations in size, profile, and dimensions are minor and do not alter the aesthetic effect. Refer to Division 1 Section "Substitutions."

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acorn Window Systems.
2. Alenco Commercial Division.
3. Capitol Products Corp.
4. DeSCo Windows.
5. EFCO Corporation.
6. Wausau Metals Corporation.
7. Winco Manufacturing Co.

B. Aluminum Extrusions: Alloy and temper recommended for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and not less than 0.062 inch (1.6 mm) thick at any location for main frame and sash members. Minimum frame section depth shall be not less than 2".

C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted to be noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Except for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

D. Anchors, Clips, and Window Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel complying with ASTM B 633 and of sufficient strength to withstand design pressure indicated.

E. Hardware: Aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

F. Accessories: Manufacturer's standard accessories that comply with indicated standards.

G. Fixed Windows: Comply with requirements of AAMA Grade and Performance Class F-R15.

H. Fabrication: Window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units. Provide units that are reglazable without dismantling sash or ventilator framing.

I. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance, thermal barrier, between exterior materials and window members exposed on interior, in a manner that eliminates direct metal-to-metal contact.

1. Weep holes and internal passages to conduct infiltrating water to exterior.
2. Glazing Stops: Screw-applied or snap-on glazing stops. Finish to match windows.

J. Preglazed Fabrication: Preglaze window units where possible and practical. Comply with glass and glazing requirements of Division 8 Section "Glazing" of these Specifications and AAMA 101.

K. Finishes: Comply with NAAMM "Metal Finishes Manual." Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

L. Class II, Clear Anodic Finish: AA-M12C22A31.

M. Class I, Clear Anodic Finish: AA-M12C22A41.

N. Class II, Color Anodic Finish: AA-M12C22A32/A34.

O. Class I, Color Anodic Finish: AA-M12C22A42/A44.

1. Color: Light bronze.
2. Color: Medium bronze.
3. Color: Dark bronze.
4. Color: Black.
5. Color: As selected by Architect from the full range of industry colors and color densities.

P. Baked-Enamel Finish: AA-C12C42R1x. Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer and topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 0.7 mils (0.02 mm), medium gloss.
   a. Color: As selected by Architect from manufacturer's full range of colors.

1.3 EXECUTION

A. Inspection: Inspect openings before installation. Verify that rough opening is correct and sill plate is level.

B. Installation: Comply with manufacturer's recommendations for installing window units, hardware, operators, and other components. Set windows plumb, level, and true to line, without warp or rack of frames or sash. Anchor securely in place.

1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action.

C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets to provide weathertight construction. Coordinate installation with wall flashings and other components of the Work.

D. Field Quality Control: Conduct on-site tests with window manufacturer's representative present. The Architect will select units to be tested. Testing shall be performed by a qualified independent testing agency selected by the Architect.

1. Air-Infiltration Tests: Conduct according to requirements of ASTM E 783. Allowable infiltration shall not exceed 1.5 times the amount indicated.
2. Water-Resistance Tests: Conduct according to requirements of ASTM E 1105. No water leakage is permitted.
3. Window units not meeting specified requirements and units having similar deficiencies shall be corrected at no cost to the Owner.

E. Clean aluminum promptly after installing windows. Avoid damage to finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

F. Clean glass of preglazed units promptly after installing windows.

G. Protect installed aluminum windows to ensure that they are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08520

SECTION 08711 - FINISH HARDWARE

1.1 GENERAL

A. Acceptable Manufacturers/Products: Acceptable manufacturers for various types of products are listed below. An asterisk (*) following a manufacturer's name designates manufacturer whose products are indicated in Finish Hardware Schedule. Such products are listed in the schedule by specific reference to manufacturers catalog numbers. Except as otherwise indicated, products of equivalent quality, design and function by other listed manufacturers may be used, subject to approval of Architect.

B. Submit final hardware schedule organized by "hardware sets", to indicate specifically the product to be furnished for each item required on each door.

1. Furnish Templates to each fabricator of doors and frames, as required for preparation to receive hardware.

C. Provide full information on all specific hardware items including, installation information, security requirements, and power or other utility requirements. General contractor is responsible to coordinate all required trades for complete installation.

D. For fire-rated openings provide hardware tested and listed by UL or FM (NFPA Standard 80). On panic exit devices, provide UL or FM label indicating "Fire Exit Hardware".

E. Submit samples of hardware items, showing each required finish from each manufacturer (for acceptance of color and texture only).

F. Comply with all requirements of the Americans with Disabilities Act requirements for all door hardware.

1.2 PRODUCTS

A. Finish and base material designations are indicated in accordance with ANSI A156.18 or the nearest traditional U.S. commercial finish. Finish shall match the existing building hardware finish.

B. Hinges and Pivots:

1. Mfrs. of Butts: McKinney, Hager, Stanley.
2. Mfrs. of Pivots: Jackson Exit Device, LCN, Norton, Rixson- Firemark, Russwin, Stanley.
3. Provide full-mortise type hinges on each door, except as otherwise indicated, and except as otherwise needed for proper support and operation of doors.
    a. Provide stainless steel pins, except steel pins with steel hinges; non-removable for exterior and public interior exposure, non-rising for non-security exposure, flat button with matching plugs.
    b. Ball-bearing Function: Swaged, inner leaf beveled, square corners.
    c. Plain-bearing Function: Swaged, inner leaf beveled, rounded corners; except provide ball-bearing for doors equipped with closers.

C. Locks, Latches and Bolts:

1. Mfrs. of Lock/Latch Sets, Including Cylinders: Match existing lock and keying system.
2. Mfrs. of Exit Devices: Sargent, Von Duprin.
3. Mfrs. of Door Bolts: Quality, Ives, Russwin, Sargent, Stanley.
4. Strikes: Wrought box strikes, with extended lip for latch bolts. Provide dust-proof strikes for foot bolts.
5. Equip exit devices with dogging devices where door has closer, except when door is fire-rated.

D. Locks: Equip lock sets with 6-pin tumbler type lock cylinders, in a masterkey system, to be

designated by Owner.

1. Construction Locks: Either temporary cylinders for construction period, or temporary construction keying which is automatically voided through use of Owner's keys.
2. Provide 3 change keys for each lock, plus 5 masterkeys for each master key system. Stamp keys "DO NOT DUPLICATE".
3. Provide key control system, , including metal cabinet with 150% capacity, envelopes, labels, tags, clips, forms, card index and markers; standard system with keys installed and index prepared by key control manufacturer.

E. Push/Pull Units:

1. Mfrs. of Push/Pull Units: Quality, Builders Brass Works, Russwin, Triangle Brass.

F. Door Control Devices:

1. Mfrs. of Closers: LCN, Sargent.
2. Mfrs. of Holders, Stops, Bumpers: Quality, Builders Brass Works, Corbin, Sargent or Stanley.
3. Provide grey rubber exposed resilient parts.

G. Finish exposed metal to match hardware, except finish floor plates to match thresholds.

1. Provide recessed plates, wherever possible, to receive insert of floor finish.

H. Size and mount units indicated or, if not indicated, to comply with mfr.'s recommendations for the exposure condition. Reinforce the substrate as recommended.

1. Where parallel-arm closers are indicated, provide units one size larger than recommended for standard-arm units.

I. Silencers: Provide silencers in metal door frames, unless not permitted for fire rating, or unless bumper-type weatherstripping is provided; 3 per single-door frame, 4 per double-door frame.

J. Coordinators: Provide coordinator device for pairs of doors with closers, wherever there is the possibility of leaves closing in wrong sequence.

K. Miscellaneous Door Hardware:

1. Mfrs. of Miscellaneous Hardware: Provide plates, trim, viewers, and similar units as indicated, produced by Quality*, Baldwin, Builders Brass Works or Ives.
2. Fabricate plates and edge trim units 1/16" to 1/2" smaller than actual door dimension. Install with self-tapping screws.
   a. Provide .050” thick (18 ga.) steel with beveled edges for kick plates, armor plates, and edge protection stripping. Finish to match all other hardware.

L. Weatherstripping:

1. Mfrs. of Weatherstripping: Pemko, Reese.
2. Provide manufacturer’s standard weatherstripping of type, size and profile indicated, continuous at head and jamb edges of each exterior door opening. Provide non-corrosive fasteners.

M. Thresholds: Comply with ADA requirements.

1. Mfrs. of Thresholds: Pemko*, Reese.
2. Provide extruded aluminum threshold of type, design and profile indicated, complete with replaceable resilient vinyl wiper-type insert. Provide non-corrosive fasteners.

1.3 EXECUTION

A. Hardware Mounting Heights: Door and Hardware Institute "Recommended Locations for Builders

Hardware for Standard Steel Doors and Frames", and current ADA requirements.

B. Install each hardware item to comply with manufacturer's instructions and recommendations.

C. Set thresholds where required for interior and exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant. Remove excess sealant and clean adjacent surfaces.

D. Hardware Adjustment: Return to project one month after Owner's occupancy, and adjust hardware for proper operation and function. Instruct Owner's personnel in proper maintenance and adjustment.

HARDWARE GROUPS:

NOTE: MATCH EXISTING FINISH AND KEY SYSTEM

GROUP 1

1	SET	CYLLINDERS	AS REQUIRED BY DOOR MFG BALANCE OF HARDWARE BY OTHERS

GROUP 2

ALL HARDWARE BY DOOR MFG

GROUP 3

1.5	PAIR	BUTTS	BB5000 4.5 X 4.5	BOMMER
1	EACH	LOCKSET	93K7 AB 15C	BEST
1	EACH	CLOSER	4041	LCN
1	EACH	KICKPLATE	10” X 2” LDW	QUALITY
1	EACH	STOP	302	QUALITY

GROUP 4

3	PAIR	BUTTS	BB5000 4.5 X 4.5	BOMMER
1	EACH	LOCKSET	93K7 AB 15C	BEST
2	EACH	CLOSER	4041	LCN
1	SET	AUTO FLUSH BOLT	559	IVES
1	EACH	COORDINATOR	COR	GJ
2	EACH	KICKPLATE	10” X 2” LDW	QUALITY
2	EACH	STOP	331	QUALITY
1	SET	SMOKE SEAL	2525 X 127	NG

GROUP 5

1.5	PAIR	BUTTS	BB5000 4.5 X 4.5	BOMMER
1	EACH	PRIVACY	93K0 L 15C	BEST
1	EACH	CLOSER	4041	LCN
1	EACH	KICKPLATE	10” X 2” LDW	QUALITY
2	EACH	STOP	331	QUALITY
1	SET	SMOKE SEAL	2525	NG

END OF SECTION 08711

SECTION 08800 - GLAZING

1.1 - GENERAL

A. System Performance Requirements: Provide glazing systems capable of withstanding normal thermal movement, wind loading, and impact loading, without failure including loss or glass breakage attributable to: defective manufacture, fabrication, and installation; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Provide glass lites in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria based on analysis of Project loads and in-service conditions:

1. Exterior Entrance Doors and Storefront – Insulated glass units, tinted outside lite, safety galss where required by International Building Code or where shown.
2. Minimum glass thickness, nominally, of lites in exterior and interior walls is 6.0 mm (0.23 inch).
3. Minimum assembly thickness for sealed insulating glass units is 20mm (0.75 inch).

C. Submittals: In addition to product data, submit 12-inch-square samples of each type of glass indicated, except for clear monolithic glass products, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

E. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants.

F. Compatibility test report from insulating glass edge sealant manufacturer indicating glass edge sealants were tested for compatibility with other glazing materials.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers, "FGMA Glazing Manual," and publications of AAMA, LSGA, and SIGMA as applicable to products indicated, except where more stringent requirements are indicated.

H. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

I. Insulating Glass Certification Program: Provide insulating glass units permanently marked with appropriate certification label of inspecting and testing agency indicated below:

1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).
3. National Certified Testing Laboratories (NCTL).

1.2 - PRODUCTS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products from one of the following manufacturers.

B. Float Glass: ASTM C 1036, Type I, Class as indicated below, and Quality q3:

1. Class 2 (tinted, heat-absorbing, and light-reducing) where indicated. Color: Grey

C. Heat Treated Float Glass, Fabrication: Fabricate heat-treated float glass by the following method:

1. Horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

D. Heat-Treated Float Glass Products: Kind: FT unless shown otherwise.

1. Uncoated, Tinted, Heat-Treated Float Glass: ASTM C 1048, Condition A, Type I, Class 2, Quality q3, with grey tint color and performance characteristics for 6.0-mm-thick (0.23-inch-thick) glass matching those indicated for annealed primary tinted float glass.

E. Sealed Insulating Glass Units: Preassembled units complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.

1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section.
2. Provide heat-treated, coated float glass where safety glass is designated or required.
3. U-values are expressed as Btu/hour x sq. ft. x deg F.

F. Elastomeric Glazing Sealants: Products complying with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, in colors indicated, compatible with other materials they will contact.

1. Additional Movement Capability: Provide products, when tested per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

I. Compression Gaskets: Molded or extruded as determined by manufacturer, gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.

J. Miscellaneous Glazing Materials: Products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

K. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing publications as required to comply with system performance requirements.

1. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

1.3 - EXECUTION

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in "FGMA Glazing Manual."

B. Protect glass from edge damage during handling and installation.

C. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

D. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

E. Lock Strip Gasket Glazing: Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

F. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter.

G. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

H. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

1.1 GENERAL

A. Work included in this section:

1. Gypsum Drywall
2. Water Resistant Backing Board
3. Metal Support and Partition Systems

NOTE: METAL PARTITION FRAMING SYSTEMS ARE PROVIDED AS A CONTRACTOR OPTION FOR NON-LOAD BEARING WALLS.

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.2 PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Framing and Furring:
   a. Clark Steel Framing, Inc.
   b. Consolidated Systems, Inc.
   c. Dale Industries, Inc.
   d. Dietrich Industries, Inc.
   e. Marino/Ware (formerly Marino Industries Corp.).
   f. National Gypsum Co.; Gold Bond Building Products Division.
   g. Unimast, Inc.

2. Gypsum Board and Related Products:
   a. Domtar Gypsum.
   b. Georgia-Pacific Corp.
   c. National Gypsum Co.; Gold Bond Building Products Division.
   d. United States Gypsum Co.

B. Steel Framing Components for Suspended and Furred Ceilings: Provide components complying with ASTM C 754 for conditions indicated.

1. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch (1.6 mm) thick.2. Hanger Wires and Rods: Mild steel and zinc coated or protected with rust-inhibitive paint. Size conforming with UBC requirements, not less than 0.145 inch (4.19 mm) (10 gage) for suspension wires.
2. Channels: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base metal and 7/16-inch- (11.1-mm-) wide flanges, and as follows:
   a. Carrying Channels: 2 inches (50.8 mm) deep, 590 lb/1000 feet (88 kg/100 m), unless otherwise indicated.
   b. Furring Channels: 3/4 inch (19.1 mm) deep, 300 lb/1000 feet (45 kg/100 m), unless otherwise indicated.
   c. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.

3. Steel Studs for Furring Channels: ASTM C 645, 3.5 inches min depth unless otherwise indicated and with 0.0179-inch (0.45-mm)(26 gage) minimum base metal thickness, unless otherwise indicated.
   a. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating for framing for exterior soffits and ceiling suspension members in areas within 10 feet (3 m) of exterior walls.
   b. Provide minimum 2" X 6" solid blocking for installation of wall mounted equipment, fixtures and/or devices. Blocking requirements shall be coordinated with requirements of other Sections.
4. Steel Resilient Furring Channels: Standard product fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M) to form •-inch- (12.7-mm-) deep channel of the following configuration:
   a. Double-Leg Configuration: Hat-shaped channel with 1-1/2-inch- (38.1-mm-) wide face connected to flanges by double-slotted or expanded-metal legs (webs).
5. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung system conforming with UBC requirements for size.

C. Steel Framing for Walls and Partitions: Provide steel framing members complying with the following requirements:

1. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating for framing members attached to and within 10 feet (3 m) of exterior walls.2. Steel Studs and Runners: ASTM C 645, in depth indicated and with 0.0179-inch (0.45-mm) (Minimum 26 gage) base metal thickness, unless otherwise indicated.
   a. Provide 0.0329-inch (0.84-mm) minimum base metal thickness for head runner, sill runner, jamb, and cripple studs at door and other openings.
   b. Provide 0.0329-inch (0.84-mm) minimum base metal thickness in locations to receive cementitious backer units.
2. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M) to form •-inch- (12.7-mm-) deep channel of the following configuration:
   a. Double-Leg Configuration: Hat-shaped channel with 1-1/2-inch- (38.1-mm-) wide face connected to flanges by double-slotted or expanded-metal legs (webs).

D. Fasteners for Metal Framing: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

E. Gypsum Board Products: Types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.

1. Gypsum Wallboard: ASTM C 36, 5/8 inch thickness unless otherwise indicated.
   a. Type: Type X for fire-resistance-rated assemblies.
   b. Edges: Tapered.

F. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047, formed metal, with metal complying with the following requirement:

1. Steel sheet zinc coated by hot-dip process or rolled zinc.

G. Joint Treatment Materials: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

1. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
2. Joint Tape for Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
3. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
   a. For prefilling gypsum board joints, use formulation recommended by gypsum board

manufacturer.
b. For filling joints and treating fasteners of backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
c. For topping compound, use sandable formulation.

4. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
   a. Ready-Mixed Formulation: Factory-mixed product.
      1) All-purpose compound formulated for both taping and topping compounds.
5. Joint Compound for Cementitious Backer Units: Material recommended by cementitious backer unit manufacturer.

H. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

I. Miscellaneous Materials: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
1. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.
3. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
4. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation to comply with ASTM C 665 for Type I.
5. Thermal Insulation: See Section 07210.

1.3 EXECUTION

A. Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

1. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
2. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
   a. Where building structure abuts ceiling perimeter or penetrates ceiling.
   b. Where partition framing and wall furring abut structure, except at floor.

3. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

B. Installing Steel Framing for Suspended and Furred Ceilings: As follows:

1. Sway-brace suspended steel framing with hangers used for support.
2. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
3. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.3. For exterior soffits, install cross-bracing and additional framing to resist wind uplift.
4. Installing Steel Framing for Walls and Partitions: Install steel studs and furring at spacing of 16 inches on-center unless otherwise indicated.
5. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
6. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions

above ceiling to provide support for gypsum board.

7. Cut studs • inch (13 mm) short of full height to provide perimeter relief.
8. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
9. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated.
10. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.
11. Install thermal insulation as indicated and to comply with requirements of manufacturer's directions.

C. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

1. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
4. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
5. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 3/8-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
6. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
7. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
   a. Fasten with screws.

D. Installing Trim Accessories: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

1. Install cornerbead at external corners.
2. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
   a. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
   b. Install U-bead where indicated or at termination of exposed GWB edges.
   c. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

E. Finishing Gypsum Board Assemblies: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

1. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
2. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
3. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

a. Level 4 for gypsum board surfaces, unless otherwise indicated.

4. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

END OF SECTION 09255

SECTION 09651 - RESILIENT TILE FLOORING AND STAIR TREADS

1.1 GENERAL

A. Submittals: As follows:

1. Product Data: For each type of product specified.
2. Samples: Of each different color and pattern of resilient product specified.

B. Extra Materials: Deliver extra materials to Owner as follows:

1. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient accessory installed.

1.2 PRODUCTS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resilient Tile Flooring Schedule at the end of this Section.

B. Rubber Stair Treads: Products of style suitable for use indicated and complying with FS RR-T-650, Composition A and with requirements specified in the Resilient Tile Flooring Schedule.

C. Risers: Products of same manufacturer as stair treads and complying with requirements specified in the Resilient Tile Flooring Schedule.

D. Stringers: Products of same manufacturer as stair treads and complying with requirements specified in the Resilient Tile Flooring Schedule.

E. Rubber Accessory Moldings: Products complying with requirements specified in the Resilient Tile Flooring Schedule.

F. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

G. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1.3 EXECUTION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

B. Preparation: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

C. Tread Installation: Comply with tile manufacturer's written installation instructions.

1. Install stair treads to assure that surface alignment of nosing edges on riser face does not exceed 1/8-inch.

D. Resilient Accessory Installation: Install resilient accessories according to manufacturer's written installation instructions.

E. Clean and protect resilient products according to manufacturer's written recommendations. Clean resilient products after installation and not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project.

RESILIENT TILE FLOORING SCHEDULE:

Rubber Wall Base (RWB or RB); Where this designation is indicated, rubber wall base complying with the following:

Product Manufacturers:

Robbins, Inc. Flexco
Roppe Corporation
Johnsonite Corporation

Colors and Patterns: As selected by Architect from manufacturer's full range of colors and patterns produced for Rubber Wall Base complying with requirements indicated.

Style:	Cove with top-set toe
Minimum Thickness:	1/8" gage (3.2 mm)
Height:	4" (101.6 mm) high 6" (152.4 mm) high
Length:	Cut lengths 48 inches (1219.2 mm) long or coils in lengths standards with manufacturer, but not less that 96 feet (29.26m)
Outside Corners:	Premolded
Inside Corners:	Premolded or formed on job
Ends:	Premolded
Surface:	Smooth

RESILIENT STAIR ACCESSORIES

Stair Treads, Risers and Skirts: Treads: FS RR-T-650

Product Manufacturers:

AFCO-USA, American Floor Products Company, Inc.
Burke Mercer Flooring Products
Johnsonite
Marley Flexco (USA), Inc.
Musson, R. C. Rubber Co.
Pirelli Rubber Flooring
Roppe Corporations

Material:	Rubber, Composition A
Surface Design:	Type 2 design (designed), Raised-diamond pattern
Nosing Style:	Square, adjustable to cover angles between 60 and 90 degrees.
Nosiing Height:	2 inches (51 mm)
Thickness:	Minumim 1/4 – inches
Size:	Lengths and depths to fit each stair tread in one piece.
Risers:	Smooth, flat, toeless, height and length to cover risers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads. Thickness: 0.125 inch (3.2mm)
Stringers:	Of same thickness as risers, height and length after cutting to fit risers and treads and recommended by manufacturer for installation with treads.

Fire-Test-Response Characteristic: Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

END OF SECTION 09651

SECTION 09900 - PAINTING

1.1 GENERAL

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Submittals: For each paint system specified, provide the following:

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated. After color selection, the Architect will furnish color chips for surfaces to be coated.

F. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Submit Samples on the following substrates for the Architect's review of color and texture only:

a. Provide two 4-inch- (100-mm-) square samples for each color and finish.

G. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

H. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

I. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers in clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

J. Project Conditions: Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.2 PRODUCTS

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers.

C. Colors: Provide color selections made by the Architect.

1.3 EXECUTION

A. Examine substrates, areas, and conditions under which painting will be performed for compliance with paint application requirements. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.

C. Preparation: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

E. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

   1. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

      a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
      b. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

   2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

      a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

F. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
2. Use only thinners approved by paint manufacturer and only within recommended limits.

G. Application: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in items are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
8. Sand lightly between each succeeding enamel or varnish coat.

H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer, but not less than 4.0 mils for the entire coating system of prime and finish coats.

K. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

L. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to

insufficient sealing.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

N. Field Quality Control: The Owner reserves the right to engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

1. The testing agency will perform appropriate tests as required by the Owner.
2. If tests show material being used does not comply with specified requirements, the Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

O. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

P. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

Q. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

PAINTING SCHEDULE

General: Provide the following paint systems for the various substrates, as indicated:

Concrete Floor seal on existing and new floor slabs after Cleaning: Rustoleum 6010-408 floor seal.

Exterior Low-Luster Acrylic Paint for masonry and plaster:

Benjamin Moore:	MoorGard Latex House Paint No. 103.
Coronado:	410 Line Crylicote Gold Collection Satin Acrylic House & Trim.
Dulux Paint:	2403-XXXX Dulux Exterior Latex Satin Finish.
Kelly-Moore:	1245 Acry-Velvet Exterior Low Sheet Acrylic Finish.
M.A.B. Paint:	Sea Shore/Four Seasons Acrylic Latex Satin House Paint 060 Line.
Pittsburgh Paints:	76 Line Sun-Proof Exterior House & Trim Acrylic Satin Latex.
Sherwin-Williams:	SuperPaint Exterior Latex Satin Wall Paint A89 Series.

Ferrous Metal: Provide the following finish systems of ferrous metal - Exterior Surfaces
Semi-Gloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer (may be factory applied primer).

Prime Coat: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

Devoe:	13101 Mirrolac Rust Penetrating Metal Primer.
Fuller:	621-04 Blox-Rust Alkyd Metal Primer.
Glidden:	5205 Glid-Guard Tank and Structural Primer, White
PPG:	6-208 Speedhide Interior Quick-Drying Enamel Undercoat.
P & L:	S/D 1009 Suprime •9" Interior/Exterior Alkyd Metal. Primer.

S-W: Kem Kromik Metal Primer B50N2/B50W1.

First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

Devoe: 17XX Wonder-Shield Semi-Gloss Exterior Acrylic Latex House and Trim Paint.
Fuller: 664-XX Weather King II Semi-Gloss House and Trim Paint.
Glidden: 6600 Series Spred Ultra Exterior Gloss Latex House and Trim Paint.
PPG: 78 Line SunProof Semi-Gloss Acrylic Latex House and Trim Paint.
P & L: Z/F 3100 Series Aqua Royal Latex House and Trim Finish.
S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.

Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal - Exterior Surfaces

Semigloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.

Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

Devoe: 8502/8520 Mirrolac-WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
Fuller: 621-05 Blox-Rust Latex Metal Primer.
Glidden: 5205 Glid-Guard Tank and Structural Primer, Red.
PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Latex Metal Primer.
P & L: Z/F 1003 Suprime •3" Interior/Exterior Latex Metal Primer.
S-W: Galvite Paint B50W3.

First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

Devoe: 17XX Wonder-Shield Semi-Gloss Exterior Acrylic Latex House and Trim Paint.
Fuller: 664-XX Weather King II Semi-Gloss House and Trim Paint.
Glidden: 6600 Series Spred Ultra Exterior Gloss Latex House and Trim Paint.
PPG: 78 Line SunProof Semi-Gloss Acrylic Latex House and Trim Paint.
P & L: Z/F 3100 Series Aqua Royal Latex House and Trim Finish.
S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.

Interior Masonry & Plaster: Semigloss Acrylic-Enamel Finish: 2 Finish Coats over a block filler.

Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).

Devoe: 52902 Bloxfil 200 Interior/Exterior Latex Block Filler
Fuller: 280-00 Interior/Exterior Latex Block Filler
Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior
PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler
P & L: Z 98 Pro-Hide Plus Latex Block Filler
S-W: S-W Pro-Mar Block Filler.

First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
Fuller: 214-XX AA Enamel Interior Acrylic Latex Semi-Gloss Enamel.
Glidden: 8200 Series Ultra Latex Semi-Gloss Enamel
PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex
P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.
S-W:

Gypsum WallBoard & Interior Plywood: Semi-Gloss Acrylic-Enamel Finish: 2 coats over a primer.

Primer: Latex-base, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

Devoe: 50801 Wonder-Tones Interior Vinyl Primer-Sealer.
Fuller: 220-20 Pro-Tech Latex Wall Primer Sealer, White.
Glidden: 5111 Spred Ultra Latex Primer-Sealer.
PPG: 17-10 Quick-Dry Interior Latex Primer-Sealer.
P & L: Z/F 1001 Suprime •1" 100 Percent Acrylic Multi-Purpose Primer
S-W: Pro-Mar 200 Interior Latex Wall Primer B28W200.

First and Second coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
Fuller: 214-XX AA Enamel Interior Acrylic latex Semi-Gloss Enamel.
Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
PPG: 88-110 Satinhide Interior Enamel Wall and Trim Lo-Lustre Semi-Gloss Latex.
P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.
S-W:

2-Component Epoxy Emulsion Coating with Gloss Finish: Provide 2 finish coats epoxy emulsion, gloss, over concrete masonry block filler.

Filler Coat: Concrete masonry block filler or gypsum wallboard primer coat.
Second Coat: Epoxy Emulsion, Gloss.

Ferrous Metal: Provide the following finish systems of ferrous metal - Interior Surfaces

Semi-Gloss, Acrylic-Enamel Finish: 1 finish coat over an enamel undercoater and a primer (may be factory applied primer).

Prime Coat: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
Fuller: 621-04 Blox-Rust Alkyd Metal Primer.
Glidden: 5207 Glid-Guard Tank and Structural Primer, White
PPG: 6-208 Speedhide Interior Quick-Drying Enamel Undercoat.
P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer
S-W: Kem Kromik Metal Primer B50N2/B50W1.

Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 (0.031 mm).

Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
Fuller: 220-07 Interior Alkyd Enamel Undercoat.
Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
P & L: S/D 1011 Suprime •11" Interior Alkyd Wood Primer
S-W: ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.

Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.

Fuller: 110-07 Fullerglo Alkyd Enamel Undercoat.
Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-gloss.
P & L: S/D 5700 Cellu-Tone Alkyd Satin Enamel.
S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.

Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal - Interior Surfaces

Semigloss, Acrylic-Enamel Finish: 2 coats over a primer.

Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

Devoe: 13201 Mirrolac Galvanized Metal Primer.
Fuller: 621-05 Blox-Rust Latex Metal Primer.
Glidden: 5207 Glid-Guard Tank and Structural Primer, White.
PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
P & L: Z/F 1003 Suprime •3" Interior/Exterior Latex Metal Primer.
S-W: Galvite Paint B50W3.

First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
Fuller: 214-XX AA Enamel Interior Acrylic Latex Semi-Gloss Enamel.
Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
PPG: 88-10 Satinhide Interior Enamel Wall and Trim Lo-Lustre Semi-Gloss Latex.
P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.
S-W: Classic 99 Interior Alkyd Semi-Gloss Enamel A-40 Series.

Stained Woodwork: Provide the following stained finishes over new, interior woodwork:

Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler before applying stain.

Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.

Devoe: None required.
Fuller: 680-00 Pen-Chrome Paste Wood Filler.
Glidden: Glidden Paste Wood Filler.
PPG: None required
P & L: None required
S-W: Sher-Wood Fast-Dry Filler

Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.

Devoe: 96XX WoodWorks Alkyd Interior Stain.
Fuller: 640-XX Pen-Chrome Interior Oil Base Wood Stain
Glidden: 1600 Series Woodmaster Oil Wood Stain.
PPG: 77-302 Rez Interior Semi-Transparent Stain.
P & L: S-Series Tonetic Wood Stain.
S-W: Oil Stain A-48 Series.

Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

Devoe: 4900 WonderWorks Quick-Dry Clear Sealer.

Fuller:	None recommended
Glidden:	5035 Ultra-Hide Quick-Dry Sanding Sealer, Clear.
PPG:	77-30 Rez Interior Quick-Drying Sealer and Finish
P & L:	H-40 Sanding Sealer.
S-W:	Pro-Mar Varnish Sanding Sealer B26V3.

First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.

Devoe:	4600 WonderWorks Alkyd Satin Varnish.
Fuller:	653-01 EPA Compliant Clear Polyurethane Satin Finish.
Glidden:	82 Satin Sheen Woodmaster Polyurethane Clear Finishes Varnish.
PPG:	77-7 Rez Varnish, Interior Satin Oil Clear.
P & L:	H24 38 Clear Finish Gloss.
S-W:	Oil Base Varnish, Gloss A66V91.

PROVIDE 2% OF MATERIAL REQUIRED (EACH COLOR) IN ORIGINAL UNOPENED CONTAINERS TO OWNER FOR REPAIR OR REPLACEMENT STOCK. MINIMUM ONE GALLON REQUIRED.

END OF SECTION 09900

SECTION 09986 - FIBERGLASS REINFORCED WALL PANELS

1.1 - GENERAL

A. Types of FRP surfaced paneling for Toilet Room.

1. Minimum 1/8" FRP board bonded to 5/8" Gypsum Wall Board with full-buttered adhesive and mechanical anchors.

B. Product Data: Submit for each paneling specified. Include installation and maintenance instructions, durability, fade resistance, physical characteristics, and flame resistance characteristics.

C. Shop Drawings: Show location and extent of each paneling specified; include indication of termination points. Show installation details at nonstandard conditions.

1. Submit manufacturer's standard 4 by 4 inch samples showing full range of color specified and patterns available.

D. Maintenance Data: Submit maintenance instructions for each paneling for inclusion in Operating and Maintenance Manual.

1. Include methods and frequency recommended for maintaining optimum condition and precautions on use of cleaning materials which could be detrimental to finishes or might damage paneling.

1.2 - PRODUCTS

A. Wall panel

1. approved manufacturer's:

a. Kemply FRP by Kemlite Company, 1-800-435-0080
b. Tufliner by BP Chemicals, Inc., 1-800-443-4566
c. Lasco Panel Products, 1-800-626-1220
d. Nudo Products, Inc., 1-800-826-4132
e. Sequentia Inc., 1-619-273-2331
f. Stennex by United Panel, Howe Building Products, 487-9618

2. Color and texture shall be selected by the Architect from manufacturer=s full range of colors and textures.

3. Panels shall have normal water absorption property of 0.4% and normal coefficient of linear expansion of 1.7 x 10(-5).

4. Panels shall meet flame spread and smoke development ratings specified for Class C(III) interior (exterior) finish under the 1994 Uniform Building Code.

B. Moldings: Furnish moldings and trim fabricated by the same manufacturer as the paneling for vertical and horizontal joints and for perimeter edging. All joints and edges shall receive trim. Color to match panel color.

C. Anchorage Devices: Factory manufactured anchors finished to match panel provided by panel manufacturer. Panel anchorage shall be spaced not to exceed 12" O/C parallel to framing members and 24" O/C at right angles to framing members. Edges shall be anchored at 12" O/C. Conceal fasteners.

D. Adhesive: In accordance with manufacturer's requirements to bond FRP panel to backing.

1.3 - EXECUTION

A. Store inside in original undamaged packaging, in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity. Do not store rolled goods upright; lay flat, blocked off the ground to prevent sagging and warping. Maintain temperature in storage area above 40 deg F (4 deg C).

B. Maintain constant minimum temperature of 60 deg F (16 deg C) in installation areas at least 10 days before and 10 days after application of materials.

C. Illuminate installation areas using the permanent lighting system; temporary lighting alone will not be acceptable.

D. Schedule installation to minimize damage and soiling.

E. Replacement Materials: After completion, deliver not less than 16 square feet of each paneling type, color, and pattern and from the same run as materials installed.

1. Package with protective wrapping, identified with appropriate labels as replacement material.

F. Paneling Installation: Install wall and ceiling in accordance with manufacturer's recommendations using concealed mechanical anchorage and adhesive as directed by the manufacturer for this expressed purpose.

1. Install factory manufactured anchors finished to match panel surface at maximum 24" o/c in each direction in field of panel. Provide additional anchors at panel edges to prevent panel sag.
2. No sags will be allowed in installation.

G. Molding installation: Install in longest practicable lengths, by concealed mechanical anchors at maximum 18" o/c to substrate in accordance with manufacturer's instructions. Tightly butt end joints and miter all corners.

1. Install continuous edge trim on all exposed edges.
2. Assure uniform alignment of trim.

H. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.

1. Clean all adhesive and other residue from panel surfaces.

I. Provide protection needed to ensure that wall and ceiling paneling will be without deterioration or damage at time of substantial completion.

END OF SECTION 09986

SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes extruded-aluminum louvers.

B. See Division 15 Sections for louvers that are a part of mechanical equipment.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and wind loads based on a uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward, without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

B. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1. Seismic Design Criteria: IBC Seismic Zone III.

C. Thermal Movements: Provide louvers that allow for thermal movements resulting from a temperature change (range) of 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces, by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

D. Air-Performance, Water-Penetration, and Wind-Driven Rain Ratings: As demonstrated by testing manufacturer's stock units according to AMCA 500-L.

1.3 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Product test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Louvers:

a. Airline Products Co.
b. Airolite Company (The).
c. American Warming and Ventilating, Inc.

d. Arrow United Industries.
e. Carnes Company, Inc.
f. Cesco Products.
g. Construction Specialties, Inc.
h. Dowco Products Group; Safe-Air of Illinois, Inc.
i. Greenheck.
j. Industrial Louvers, Inc.
k. Louvers & Dampers, Inc.
l. Metal Form Manufacturing Company, Inc.
m. NCA Manufacturing, Inc.
n. Nystrom Building Products.
o. Reliable Products; Hart & Cooley, Inc.
p. Ruskin Company; Tomkins PLC.
q. Vent Products Company, Inc.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy 3003 or 5005.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver

1. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.5 mm) for blades and 0.080 inch (2.0 mm) for frames.
2. Performance Requirements:

    a. Free Area: Not less than 6.0 sq. ft. (0.56 sq. m) for 48-inch- (1.2-m-) wide by 48-inch- (1.2-m-) high louver.
    b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 600-fpm (3.0-m/s) free-area velocity.
    c. Wind-Driven Rain Performance: Not less than 95 percent effectiveness when subjected to a rain fall rate of 8 inches (200 mm) per hour and a wind speed of 50 mph (22.4 m/s) at a core area intake velocity of 300 fpm (1.5 m/s).

2.5 LOUVER SCREENS

A. General: Provide screen at interior face of each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:

1. Bird Screening: Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire.

2.6 FINISHES

A. Aluminum, Anodic Finish: Class I, color anodic coating complying with AAMA 611.

1. Color: As selected from full range of industry colors and densities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

END OF SECTION 10200

SECTION 10425 - SIGNS

1.1 GENERAL:

A. Submittals: Submit the following:

1. Shop Drawings: Provide plans, elevations, and sections showing typical members, anchors, layout, reinforcement, accessories, and installation details. Include the following:

a. Message list for each sign with wording and letter layout.
b. Setting drawings, templates, and directions for installing anchors.

1.2 PRODUCTS:

A. Vinyl Film: Provide opaque nonreflective vinyl film, 0.0035-inch minimum thickness, with pressure sensitive adhesive backing, suitable for exterior as well as interior applications.

B. Rigid Plastic safety and directional signs: 0.060 polystyrene, OSHA compliant. Vinyl text lettering for indoor and outdoor use. Pre-drilled for installation. As manufactured by Champion America, Inc. (1-800-521-7000) or approved equal.

C. Aluminum Sheet safety and directional signs: 0.080 aluminum, OSHA compliant. Baked enamel text lettering for indoor and outdoor use. Pre-drilled for installation. As manufactured by Champion America, Inc. (1-800-521-7000) or approved equal.

1. Backed-Enamel Finish: AA-M4xC12C42R1x. Apply baked enamel in compliance with paint manufacturer’s specifications for cleaning, conversion coating, and painting.

D. Plastic Laminate: High-pressure plastic laminate engraving stock with face and core plies in contrasting colors.

E. Unframed Panel Signs: Engraved plastic laminate, sign size as required for the text. Fabricate edges mechanically and smoothly finished. Produce smooth, even, level sign panel surfaces.

1.	Thickness:	Manufacturer's standard, not less than 1/8" overall.
2.	Finish:	Smooth.
3.	Colors:	Face - black face. Core - white. copy - white.
4.	Plastic Laminate Edge Color:	Same as copy.
5,	Edge Condition:	Beveled.
6.	Corner Condition:	Round corners, 2" radius.
7.	Text:	As selected by the Architect from manufacturer's standard letter styles.
8.	Text height:	2" or as selected by the Architect.

F. Laminated Sign Panels: Permanently laminate face panels to backing sheets.

G. Engraved Copy: Engrave characters into panel on face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates.

1. Engraved Plastic Laminate: Engrave through the exposed face ply of the plastic laminate sheet to expose the contrasting core ply.
2. Engrave copy to minimum indentation depth of 1/32 inch and minimum stroke width of 1/4 inch.

H. Fasteners: Concealed noncorrosive metal.

I. Anchors and Inserts: Nonferrous metal or hot-dipped galvanized. Use toothed steel or lead

expansion bolt devices for drilled-in-place anchors. Provide spacers for irregular surfaces. Furnish inserts for concrete or masonry work.

1.3 EXECUTION:

A. Sign List:

1.	5	EACH	AUTHORIZED PERSONNEL ONLY
2.	1	EACH	PIPE SHOP AUTHORIZED PERSONNEL ONLY
3.	1	EACH	METAL SHOP AUTHORIZED PERSONNEL ONLY
4.	1	EACH	ELECTRICAL SHOP AUTHORIZED PERSONNEL ONLY
5.	1	EACH	CARPENTRY SHOP AUTHORIZED PERSONNEL ONLY
6.	1	EACH	PAINTING AND FINISHING SHOP AUTHORIZED PERSONNEL ONLY
7.	1	EACH	OFFICES
8.	1	EACH	TOILET
9.	2	EACH	TEAM ROOM AUTHORIZED PERSONNEL ONLY
10.	10	EACH	FIRE EXTINGUISHER (VERTICAL 2-INCH LETTERING WITH AN ARROW BELOW)

B. Installation: Locate signs where indicated, using mounting methods specified. Install level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

C. Wall and/or door-mounted Panel Signs: Attach using methods indicated below:

1. Silicone-Adhesive Mounting: Liquid silicone adhesive for porous or irregular. Use double-sided vinyl tape to hold sign in place until adhesive has fully cured.
2. Shim Plate Mounting: Provide 1/8-inch-thick concealed aluminum shim plates with pre-drilled and countersunk holes. Attach plate to substrate with fasteners and anchors. Attach sign to the plate using the method specified above.

D. Cleaning: After installation, clean soiled surfaces. Protect units from damage until acceptance by the Owner.

END OF SECTION 10425

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers.
2. Mounting brackets for fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Fire Extinguishers: Include rating and classification.

B. Maintenance data.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.4 WARRANTY

A. Manufacturer's standard warranty in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within 2 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.

4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.
7. JL Industries, Inc.
8. Kidde Fyrnetics.
9. Larsen's Manufacturing Company.
10. Modern Metal Products; Div. of Technico.
11. Moon American.
12. Potter Roemer; Div. of Smith Industries, Inc.
13. Watrous; Div. of American Specialties, Inc.

B. General: Provide fire extinguishers of type, size, and capacity indicated.

1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B **and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging**.

2.3 MOUNTING BRACKETS

A. Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.
4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.
7. JL Industries, Inc.
8. Larsen's Manufacturing Company.
9. Potter Roemer; Div. of Smith Industries, Inc.

B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Color: **Red.**

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

B. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10520

SECTION 10801 - TOILET AND BATH ACCESSORIES

1. GENERAL

A. Submittals: Manufacturer's Product Data. Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
   1. Products of other listed manufacturers with equal characteristics, as judged solely by Architect, may be provided.
   2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
   3. Paper dispersing accessories shall be of the type and configuration that will dispense the products required by the Owner.

2. PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:

   1. Toilet and Bath Accessories:

      a. A & J Washroom Accessories, Inc.
      b. American Specialties, Inc.
      c. Bobrick Washroom Equipment, Inc.
      d. Bradley Corporation.
      e. General Accessory Manufacturing Co. (GAMCO).
      f. McKinney/Parker Washroom Accessories Corp.

   2. Underlavatory Guards:

      a. Brocar Products, Inc.
      b. Truebro, Inc.

B. Materials: As follows:

   1. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
   2. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
   3. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
   4. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
   5. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
   6. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
   7. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
   8. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
   9. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

3. EXECUTION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

   1. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

C. Remove temporary labels and protective coatings.

D. Clean and polish exposed surfaces according to manufacturer's written recommendations.

E. TOILET AND BATH ACCESSORY SCHEDULE:

1. The following are included in this section:

   a. SMTD (Surface Mounted Towel Dispensers)
   b. SMTTD (Surface Mounted Toilet Tissue Dispensers)
   c. LSD (Liquid Soap Dispensers, tank type)
   d. MU (Mirror Units)

2. Surface-Mounted Towel Dispensers: Fabricate of stainless steel with hinged front equipped with tumbler lockset. Provide pierced slots at sides as refill indicator.

   a. Capacity: Not less than either 300 C-fold or 400 multifold paper towels without need for special adapters.

3. Surface Mounted Roll Tissue Dispenser: Fabricate of stainless steel with satin finish for surface mounting. Provide complete with mounting hardware.

   a. Bradley Accessories, Jumbo Roll Toilet Tissue Dispenser model 5425 or approved equal

4. Liquid Soap Dispenser, Horizontal Tank Type: Fabricate for surface mounting, sized for 40-fluid-ounce minimum capacity. Provide stainless steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action. Provide cover of type 304 stainless steel in No. 4 finish, with unbreakable window-type refill indicator. Equip unit with push-type valve for dispensing soap in liquid form.

5. Stainless Steel Channel-Framed Mirror Units: Fabricate frame with channel shapes not less than 0.04 inch (20 gage), with square corners carefully mitered to hairline joints and mechanically interlocked. Provide in Type 430, bright polished finish.

END OF SECTION 10801

SECTION 11800 - SERVICE EQUIPMENT – AIR COMPRESSOR

PART 1 - GENERAL

A. RELATED DOCUMENTS: Extent of this work is indicated in the drawings and includes the following:

1. Air Compressor

B. General provisions of the contract apply to this work.

1. Coordinate mechanical and plumbing provisions with Division 15.
2. Coordinate electrical provisions with Division 16.

C. Description of the work: Provide the air compressor as shown.

D. Reference standards: Conform with all governing OSHA and safety requirements.

E. Guarantee: Provide manufacturer's written two year guarantee for materials, assembly, workmanship and installation.

F. Shop Drawings: Submit complete shop and erection/installation drawings showing equipment, materials, fabrication, fasteners, finishes, accessory installation details and anchorage to clearly indicate proper assembly and installation of components and accessories.

PART 2 - PRODUCTS

A. Air Compressors

1. General: This specification covers a self-contained compressor package consisting of the compressor, a motor, V-belt drive and totally enclosed belt guard, all mounted on an ASME Coded National Board approved air receiver. Suitable piping between the compressor, control, and receiver shall be included.

   a. Air Compressor: Two cylinder, two-stage, 10 hp, slash lube, air cooled compressor. Connect the air compressor to the air piping as shown.

2. Performance: The unit shall deliver 35 cam free air at 175 psig with ambient inlet conditions.

3. Compressor: The compressor shall be a splash lubricated, single-acting, two-stage, air-cooled, reciprocating type. The crankcase and cylinders shall be individual piece construction made of class G3000 cast iron, with deep cooling fins on the cylinders. A ductile iron crankshaft shall have integral counterweights and shall be supported on both ends by industrial ball bearings that will provide precise shaft alignment and take both radial and thrust loads. The B_{10} bearing life shall be 80,000 hours at 968 RPM and the compressor speed shall not exceed 1000 RPM. Automotive style two piece connecting rods will be aluminum with cast-on dippers to provide ample lubrication to the wrist pin area. A needle will be used on the rod pin ends. The low and high-pressure aluminum pistons shall have three automotive type cast iron compression rings and one automotive type oil ring. Stainless steel reed valves shall be secured to the aluminum valve plate by screws. The movement of the valves shall be limited to their most efficient distance by powdered metal bumpers. Aluminum heads with deep cooling fins provide less weight and better heat dissipation. A fin and tube intercooler shall be located in the direct blast on the 19” cast iron fan-type flywheel. There shall be an ASME coded pressure relief valve at the entrance of the intercooler, between the first and second stages. A 10-micron inlet air filter shall also be standard.

4. Motors: The compressor unit shall be driven by an electric motor of 10 horsepower at nominal 1750 RPM, suitable for continuous duty. The motor shall be an EPACT, high efficiency NEMA “T” frame, squirrel cage induction-type with an open drip-proof enclosed. The standard motors will have a 1.15 service factor.

5. Belt Guard: The compressor flywheel, motor pulley, and V-belts shall be totally enclosed within a metal belt guard. This provides protection on all sides in accordance with OSHA specifications. The belt guard shall be designed to provide the maximum amount of cooling air to the compressor.

6. Receivers: The compressor and motor shall be mounted on a 120 gallon, vertical receiver. It shall be ASME coded and National Board approved. The receiver shall include a check valve, ASME coded safety valves, a manual tank drain, and a pressure gauge. A manual service valve is also standard.

7. Regulation: The standard method of regulation is automatic start-stop control. Leadless starting is achieved by means of a combination discharge line pressure release valve/pressure switch and check valve. The pressure switch starts and stops the compressor on pressure demand.

8. Motor Starter: The motor starter shall be an across-the-line I.E.C. contractor in a NEMA 4 enclosure, and equipped with properly sized thermal overload protectors.

9. Dual Control: Combines auto start-stop with constant speed control. The unit can operate on auto start-stop when demand is light or on constant speed control when air demand is heavy.

10. Low Oil Level Shutdown Switch: A low oil level shutdown switch shall automatically shutdown the unit when the oil level drops below an acceptable level to provide proper lubrication. This shutdown shall not require a 120-volt control relay.

11. TEFC Motors: Totally enclosed fan cooled motors are to be 230/460 volts, 3 phase, 60 HZ of approximately 1750 RPM, with a 1.15 service factor.

12. Air-cooled After cooler: An air-cooled fin and tube air-cooled after cooler shall be connected between the compressor discharge and the receiver inlet.

13. Tank Drains: Automatic

14. Intake Filter Silencer: A hooded intake filter option to reduce the overall JBA sound level is available as an option, 8.13 dab per the CAGI/PNEUROP sound test standards.

B. Approved Manufacturer's:

1. Quincy
2. Wayne-Leroy
3. Ingersoll-Rand
4. Champion Pneumatic

PART 3 - EXECUTION

A. Install all service equipment in conformance with manufacturer's recommendations. Install and anchor fixed equipment in accordance with seismic zone III requirements.

B. Provide air service: The air compressor to the air distribution system.

1. Use schedule 80 pipe and 3000 pound fittings.

END OF SECTION 11800

SECTION 13047 - PREFABRICATED PAINT SPRAY BOOTHS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes prefabricated steel or aluminum paint spray booths.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide control booths capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

B. Seismic Zone III and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

C. Provide for connection to building fire sprinkler and fire alarm systems. Include connection to these systems.

1.3 SUBMITTALS

A. Product Data: For each type of booth indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed booth finish required.

D. Product test reports.

E. Maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with 2003 IBC requirements for paint spray booths of one-hour minimum fire rated construction. Provide certification.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.2, "Structural Welding Code--Aluminum." AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Mechanical Components, Devices, Equipment and Accessories. Complying with 2003 IBC code requirements for ventilation and environmental protection.

E. Pre-installation Conference: Conduct conference at Project site.

1.5 COORDINATION

A. Coordinate installation of anchorages for booth. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.6 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair finish or replace wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).
2. Extruded Shapes: ASTM B 221 (ASTM B 221M).
3. Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T4 or 6061-T6.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, commercial quality, G90 (Z275) coating designation; mill phosphatized.

D. Steel Mechanical Tubing: ASTM A 513, welded steel mechanical tubing[**,** hot-dip galvanized according to ASTM A 123/A 123M.

E. Plywood: DOC PS 1, Exterior grade.

F. Clear Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

G. Anchorages: Anchor bolts, hot-dip galvanized according to ASTM A 153/A 153M.

2.2 PREFABRICATED BOOTHS

A. General: Provide a complete, integrated set of manufacturer's standard, mutually dependent components that form a completely assembled, prefabricated booth, ready for installation on Project site. Control booths shall be capable of withstanding structural and other loads indicated, thermally induced movement, and exposure to weather without failure or infiltration of water into booth interior. Include structural framing, roof and wall panels, door), and accessories complying with requirements indicated. The booth shall be one-hour fire rated. Provide for connection to building fire sprinkler and fire alarm systems. Include connection to these systems.

B. Manufacturers:

1. Bleeker Brother

2. AFC Spray Booths

3. American Paint Booths

4. Col-Met Spray Booths

5. Eagle Spray Booths

6. Paasche Airbrush Company

7. Spray Shield Industries

8. Spray Systems, Inc.

9. Or equal approved by the Architect prior to bidding.

2.3 PAINT SPRAY BOOTHS

A. Provide and install a Prefabricated Paint Spray Booth with minimum inside clear dimension not less than 10-feet wide by 10-feet deep by 10-feet height. Maximum outside dimensions shall not be greater than 11-feet wide by 11-feet deep by 11-feet high. Bleeker Bros. Model No. PF-10-10-10 enclosed filter spray booth with air supply plenum and front doors. One-hour fire rated construction.

B. Wall and ceiling panels: 18 gage sandwich type, prefabricated, interlocking panel construction with reinforced formed members engineered, designed and fabricated for indoor installation.

C. Doors: Manufacturer=s standard doors and door frames designed for panel system. Also provide manufacturer=s standard door operating hardware.

1. Pair of front access filter doors with an opening size of not less than 8-feet wide and 9-feet high.

2. Side access door with an opening size of not less than 2.5-feet wide and 6.67-feet high.

3. Provide Interloks class #1, div #2, 2-inch air solenoid valve - open type for all doors.

D. Lighting: Provide four 4-tube fluorescent light fixtures of vapor-tight construction with hinged in side access windows to allow fixtures to be serviced from inside of the booth. The power service shall be 120 volt. Tubes shall be UL-approved for Class #1, Div #2, hazardous area with electric ballast for t-8, 32 watt tubes.

E. Electrical: provide all electrical power service and connection required to complete and operate the booth.

F. Exhaust and filter system: provide manufacturer=s standard exhaust and filter system as follows:

1. Exhaust operational capacity shall be not less than 13,180 CFM @ 0.375 sp.

2. Exhaust system shall discharge horizontally through the exterior building wall. All wall penetrations shall conform with the drawings and other divisions of this specification.

a. Provide weather-tight seals at all wall penetrations.

3. Provide a back or side mounted exhaust plenum chamber with not less than 42 minimum size of 20-inches by 20 inches by 3-inches thick exhaust filter cells and not less than 84 minimum size of 20-inches by 20-inches by 1-inch (two per cell) paint arrester filters with gripper filter holding grids and holding rods.

4. Provide a Manometer draft gauge

5. Provide a minimum 30-inch diameter, 6-blade, non-sparking construction, exhaust fan. Minimum TEFC motor size of 3 HP, 208 volt, 60c, 3-phase.

G. Provide a NEMA-12 control panel to operate all paint spray booth equipment that includes the following:

1. Manufacturer=s standard 208 volt, 2-phase transformer or system power service

2. 3 HP exhaust fan motor starter with overload protection

3. Terminals for remote controls for door switches, air solenoid, summer/winter operation switch, dirty filter light, and AMU-panel incorporated in booth panel.

4. Light control on-off switch for booth lighting

2.3 FABRICATION

A. Fabricate control booths completely in factory.

B. Pre-glaze windows and doors at factory.

C. Pre-wire control booths at factory, ready for connection to service at Project site.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install booths on existing 4-inch- (100-mm-) thick concrete floor slab.

B. Set booths plumb and aligned. Level base plates true to plane with full bearing on concrete floor.

C. Fasten booths to concrete floor with expansion anchors.

D. Connect electrical power service to power distribution system according to requirements specified in Division 16. Connect to building fire protection and alarm systems including the sprinkler system.

E. Adjust doors, and hardware to operate smoothly, easily, properly, and without binding. Lubricate hardware and other moving parts.

F. After completing installation, inspect exposed finishes and repair damaged finishes.

G. Wiring diagrams and assembly instructions for O and M manuals

H. System shall comply with all UL, environmental, seismic, and fm regulations and requirements. The completed booth shall be commissioned and certified in writing by the state of Utah and the Utah National Guard Environmental Department.

END OF SECTION 13047

SECTION 13125 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES METAL BUILDING SYSTEMS AS AN ALTERNATIVE TO THE FRAMED METAL COMPRESSOR BUILDING THAT CONSIST OF INTEGRATED SETS OF MUTUALLY DEPENDENT COMPONENTS INCLUDING STRUCTURAL FRAMING, ROOF PANELS, WALL PANELS, CORNICE AND GUTTER , DOORS , GRILLS AND ACCESSORIES.

B. See Division 3 Section "Cast-in-Place Concrete" for concrete foundations, slabs, and anchor-bolt installation.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Engineer metal building systems according to procedures in MBMA's "Metal Building Systems Manual."
2. Design Loads: As required by MBMA's "Metal Building Systems Manual." Roof Load: 50 psi. Wind Load 90 mph.

B. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads." Seismic Zone III.

C. Thermal Performance: Provide insulated metal panel assemblies with the following minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:

1. Metal Roof Panel Assemblies:

a. R-Value: 22

2. Metal Wall Panel Assemblies:

a. R-Factor: 13.

D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

1.3 SUBMITTALS

A. Product Data: For each type of metal building system component indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Anchor-Bolt Plans: Submit anchor-bolt plans before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.

3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

C. Samples: For each type of building component and for each color and texture required.

D. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design loads and load combinations.
9. Building-use category.
10. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

E. Welding certificates.

F. Erector Certificate: Signed by manufacturer certifying that erector complies with requirements.

G. Manufacturer certificate.

1.4 QUALITY ASSURANCE

A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

B. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.

1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Cold-Formed Steel: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members," or AISI's "Load and Resistance Factor Design Specification for Steel Structural Members," for design requirements and allowable stresses.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness and with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.6 PROJECT CONDITIONS

A. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.8 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alliance Steel, Inc.
2. American Buildings Company.
3. American Steel Building Company, Inc.; Division of NCI Building Systems, LLP.
4. Behlen Mfg. Co.
5. Butler Manufacturing Company.
6. Ceco Building Systems; Division of Robertson-Ceco Corporation.
7. Crown Metal Buildings, Inc.
8. Garco Building Systems.
9. Gulf States Manufacturers, Inc.
10. Mesco Metal Buildings; Division of NCI Building Systems, LLP.
11. Metallic Metal Building Company; Division of NCI Building Systems, LLP.
12. Package Industries, Inc.
13. Southern Structures, Inc.
14. Spirco Manufacturing; Division of Metal Building Products, Inc.
15. Star Building Systems; Division of Robertson-Ceco Corporation.
16. Steelox Systems Inc.
17. United Structures of America, Inc.
18. VP Buildings, Inc.; a United Dominion Company.

2.2 STRUCTURAL-FRAMING MATERIALS

A. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

B. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.

D. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550) or High-Strength Low Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.

E. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.3 THERMAL INSULATION FOR FIELD-ASSEMBLED METAL PANELS

A. Metal Building Insulation: [**ASTM C 991, Type I, or NAIMA 202**] [**ASTM C 991, Type II**], glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (50-mm-) wide, continuous, vapor-tight edge tabs; and with a flame-spread index of 25 or less.

B. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96, Desiccant Method.

1. Composition**:** Polypropylene film facing.

C. Retainer Strips: 0.019-inch- (0.5-mm-) thick, formed, galvanized steel or PVC retainer clips colored to match insulation facing.

2.4 DOOR AND FRAME MATERIALS

A. Per drawings and Dvision 8.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

1. Fasteners for Metal Roof and Wall Panels: Self-drilling Type 410 stainless-steel or self-tapping Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal panels.

B. Metal Panel Sealants:

1. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant.

2.6 FABRICATION, GENERAL

A. Tolerances: Comply with MBMA's "Metal Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

B. Metal Panels: Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.7 STRUCTURAL FRAMING

1. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. lates.
2. Frame Configuration: One-directional sloped Load-bearing-wall type.
3. Rafter Type: Uniform depth.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch (1.5 mm).

2. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet prepainted with coil coating, unless otherwise indicated.

2.8 METAL ROOF PANELS

A. Tapered-Rib-Profile, Lap-Seam Metal Roof Panels: Formed with raised, trapezoidal major ribs designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) steel sheet, 0.0209 inch (0.55 mm) thick.

   a. Exterior Finish: Fluoropolymer.
   b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 6 inches (152 mm).
3. Panel Coverage: 36 inches (914 mm).
4. Panel Height: 1.125 inches (29 mm).

2.9 FIELD-ASSEMBLED METAL WALL PANELS

A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs between major ribs; designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized**)** steel sheet, 0.0159 inch (0.40 mm) thick.

   a. Exterior Finish: Fluoropolymer.
   b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 6 inches (152 mm).
3. Panel Coverage: 36 inches (914 mm).
4. Panel Height: 0.75 inch (19 mm).

2.10 METAL CORNICE

A. General: Provide factory-formed metal cornice designed to be field assembled by lapping and interconnecting side edges mechanically attaching through supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels: Match profile and material of metal roof panels.

1. Finish: Match finish and color of metal roof panels.

2.11 DOORS AND FRAMES

A. As shown on drawings and specified in Division 8.

2.12 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.

D. Flashing and Trim: Formed from minimum 0.0159-inch- (0.40-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.

1. Opening Trim: Minimum 0.0159-inch- (0.40-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Gutters: Formed from minimum 0.0159-inch- (0.40-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters; spaced 36 inches (900 mm) o.c.

F. Downspouts: Formed from 0.0159-inch- (0.4-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal

wall panels. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters; spaced 10 feet (3 m) o.c.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Primary Framing: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts.

D. Erection Tolerances: Maintain erection tolerances of structural framing within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 METAL PANEL INSTALLATION, GENERAL

A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
2. Install metal panels perpendicular to structural supports, unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
5. Lap metal flashing over metal panels to allow moisture to run over and off the material.

B. Lap-Seam Metal Panels: Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or metal panels. Install screws in predrilled holes. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.

3.3 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated.

B. Field-Assembled, Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.

C. Metal Cornice: Align bottom of metal panels and fasten with blind rivets, bolts, or self-tapping screws.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

B. Field-Assembled, Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

3.5 METAL CORNICE INSTALLATION

A. Flash and seal metal cornice with weather closures where panels meet walls and at perimeter of all openings.

3.6 THERMAL INSULATION INSTALLATION FOR FIELD-ASSEMBLED METAL PANELS

A. Install insulation concurrently with metal wall panel installation, in thickness indicated to cover entire wall, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

3.7 DOOR AND FRAME INSTALLATION

A. General: Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

3.8 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet (1.2 m) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

3.9 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted framing and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 13125

SECTION 13500 - BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

A. The General Contractor shall employ an AABC certified contractor to test and balance the HVAC systems and the dust collection system.

B. As a part of this contract, the mechanical contractor shall make all changes in the sheaves, belts, and dampers, including the addition of dampers required for correct balance as required by the TAB firm, at no additional cost to the Owner.

1.3 SERVICES OF MECHANICAL CONTRACTOR:

A. The mechanical contractor shall have all systems complete, calibrated, and in operational readiness prior to notifying the TAB firm that the project is ready for their services, and the contractor shall so certify in writing to the Owner that such a condition exists.

B. Should the TAB firm be so notified and the TAB work commenced and the systems are found to not be in readiness or a dispute occurs as to the readiness of the systems, the mechanical contractor shall request an inspection be made by a duly appointed representative of the Owner, TAB firm, and the mechanical contractor. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for TAB services. Should the inspection reveal the TAB services notification to have been premature, all costs of the inspection and work previously accomplished by the TAB firm shall be paid for by the project mechanical contractor.

1.4 SERVICES OF THE TAB FIRM:

A. Act as liaison between the Owner, Owner's Representative, and contractor and inspect the installation of mechanical piping systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems. The inspection of the work will cover that part relating to proper arrangement and adequate provisions for the checking and balancing.

B. Upon completion of the installation and start-up of the mechanical equipment, to check, adjust, and balance system components to obtain optimum conditions on each conditional space in the building.

C. Prepare and submit to the Owner (or his delegated representative) complete reports on the balance and operations of the systems.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EQUIPMENT AND INSTRUMENTS:

A. This contractor shall provide all necessary labor, equipment, scaffolding, instruments, and materials required to adjust, balance, and check all systems.

3.2 REPORT:

A. The activities, as described hereinbefore, will culminate in a report to be provided to the Owner or his delegated representative. This report shall be furnished in four (4) copies. The intent of the final report is to provide a reference of actual operating conditions for the Owner's operating personnel.

END OF SECTION 13500

SECTION 15010 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 GENERAL CONDITIONS:

A. The contractor shall carefully read the General Conditions of the Contract and all information to bidders which, with the following specifications for heating, cooling, plumbing, exhaust, ventilation, and temperature control are a part of the Contract.

B. The Test and Balance Contractors shall submit their bids to the General Contractors.

1.3 WORK INCLUDED:

A. The work to be done under this section includes the furnishing of all labor, materials, equipment, accessories required to complete all heating, air conditioning, ventilating, plumbing, and other mechanical systems as show on plans and described in these specifications or required to properly complete the entire work.

1.4 CODES AND ORDINANCES:

A. The work shall be installed in accordance with the following codes: 2003 IBC, 2003 IMC, 2003 IPC, 2002 NEC, 90.1 Energy Code, 2004 Utah Pressure Vessel code, and any other state, local or government code or ordinance that governs the type of work covered by these specifications. Should the drawings conflict with the code, the code shall govern the proper installation of the work, and no extra charge shall be made for such change.

1.5 SUBSTITUTIONS AND PACKAGE PRICING:

A. No substitutions or prior approvals are allowed for mechanical equipment. Suppliers who group products into packages for package pricing must breakout individual prices at the request of the contractor, engineer, or owner. Suppliers who refuse to breakout prices, especially those who may have a sole-source item, will not be allowed to submit prices to the contractors, and the engineer will issue an addendum to omit their products from the project.

1.6 FEES AND PERMITS:

A. This contractor shall obtain all necessary permits and pay all fees required in connection with the work.

1.7 SITE INSPECTION AND EXAMINATION OF DRAWINGS:

A. The contractor shall carefully study all drawings and specifications pertaining to the work. If any of the work as laid out, indicated, or specified is contrary or conflicts with any governing ordinances or regulations, the same shall be reported to the Owner's representative before submitting a bid. The Owner's representative will then issue instructions as to procedure. The contractor shall carefully examine the building site and compare the drawings with existing conditions. By the act of submitting a bid, the contractor shall be deemed to have made such examination, and to have accepted such conditions, and to have made allowance therefore in preparing his bid.

1.8 RECORD DRAWINGS:

A. The contractor shall provide and keep up to date a complete record set of ozalid prints

which shall be corrected daily to show change from the original drawings and specifications, the size and kind of equipment, and runs of all pipes, etc. Prints for this purpose will be furnished by the Owner's Representative. This set of drawings shall be kept on the work and shall be used only as record set. Upon completion of the work, the set of record drawings shall be turned over to the Owner's Representative.

1.9 GUARANTEE:

A. By the acceptance of the contract award for the work herein described, the contractor assumes the full responsibility imposed by the guarantee as set forth herein and should protect himself through proper guarantee from equipment and specialty manufacturers and subcontractors as their interests may appear.

B. All materials and equipments provided and installed under this division of the specifications shall be guaranteed for a period of **one (1) year** from the date of substantial completion and acceptance by the Owner, unless specifically noted elsewhere in the specification. Should any trouble develop during this period due to defective materials to correct the trouble without any cost noticed at the time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner's Representative.

1.10 PAINTING:

A. All equipment which is to be furnished in factory prefinished conditions by the mechanical contractor shall be left without mark, scratch, or impairment to finish upon completion of job. Any necessary refinishing to match original shall be done. Do not paint over nameplates, serial numbers, or other identifying marks. Paint all bare piping and bare steel brackets, etc. with one coat primer and two coats enamel. Color by Architect. Paint walls in all places where the mechanical contractor is called to do so on the plans because of new penetrations, etc.

1.11 SCHEDULES, MATERIALS, AND EQUIPMENT:

A. As soon as practicable, and within 14 days after date of award of contract, and before commencement of work, a complete schedule of equipment and materials proposed for installation shall be submitted to the Owner's Representative. The schedule shall include catalogs, cuts, drawings, and such other descriptive data or samples that are requested by the Owner's Representative. Schedules shall include all items of equipment used. No partial submittals will be accepted. Provide four copies minimum.

1.12 OPERATING INSTRUCTIONS AND CATALOG INFORMATION:

A. This contractor shall compile in loose-leaf binders catalogs containing the following: Master index, contractor and vendor list and phone numbers and addresses, general HVAC description, startup procedures, ATC schematics, maintenance instructions, balancing reports, and all equipment data sheets. Four copies shall be given to the Engineer for his approval.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND ACCESSORIES:

A. Unless otherwise specified, all equipment, accessories, and materials shall be new and undamaged, and the workmanship shall be of the best quality for the use intended and shall be acceptable to the Owner's Representative. Equipment, accessories, and materials shall be essentially the standard products of the manufacturer, or as specified herein. Where two or more units of the same class of new equipment are required, these units shall be products of a single manufacturer.

2.2 MAGNETIC STARTERS:

A. Contractor furnishing packaged equipment with ½ HP and larger in size (except fan coils)

shall furnish factory-mounted magnetic starters on all motors. Magnetic starters shall provide both overload and under voltage protection and shall have integral hand-off-auto switch, auxiliary contacts, and pilot. Starters for all motors furnished under the mechanical section of the work will be furnished and installed by the electrical contractor. Provide heater index for all starters furnished under this division.

2.3 SLEEVES AND BOXES:

A. For pipes passing through masonry or concrete construction, provide sleeves at least two pipe sizes larger than the pipe passing through and made from selections of steel pipe. Provide galvanized iron sleeves with collar on each side of wall for all ducts passing through similar constructions.

B. For pipes passing through finished partitions, or ceilings, provide galvanized sheet iron sleeves of suitable size. The sleeves shall be fastened to construction to prevent creep along pipe and the sleeve ends shall be flush with finished surfaces. Provide escutcheon plates at each side of finish wall or floor or ceiling for all pipes passing through same.

2.4 ACCESS DOORS:

A. Install access doors at all fire/smoke dampers and fire dampers. Access doors to be 12" x 12" minimum clear opening size.

PART 3 - EXECUTION

3.1 FUNCTIONING AND OPERATION OF EQUIPMENT:

A. Each Contractor is to be prepared to show the actual operation of each piece of equipment in its completed working condition.

3.2 CLEANING BY MECHANICAL CONTRACTOR:

A. The contractor shall remove all stains or grease marks on walls or elsewhere caused by his workman or for which he is responsible. He shall also remove all rubbish resulting from his work, shall remove all stickers on fixtures, adjust all valves, etc., and leave the premises in first-class order.

3.3 SAFETY REGULATION:

A. The contractor shall comply with all State, Utah National Guard, local, and OSHA safety requirements in performance with this work. (See General Conditions). This contractor shall be required to provide equipment, supervision, construction, procedures, and all other necessary items to assure safety to life or property.

3.4 EQUIPMENT IDENTIFICATION

A. All mechanical equipment shall be identified with a plastic engraved label permanently attached by screws or rivets. The identification shall match the same callout as used in the plans and specifications' e.g., F-1, CU-1, etc.

B. Valves on piping shall be tagged with engraved brass tags attached with small link chain.

END OF SECTION 15010

SECTION 15020 - SEISMIC RESTRAINT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

A. All equipment, piping, and ductwork shall be adequately restrained to resist seismic forces. Restraint of rigidly mounted ductwork and piping may conform to "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", SMACNA/PPIC, Latest Edition, and calculations need not be submitted for restraint systems conforming to these guidelines. Also follow requirements of 2003 IBC.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Products shall be made expressly for the purpose of seismic restraint, and shall be manufactured by Mason or Amber/Booth or equal.

PART 3 - EXECUTION

3.1 WORK:

A. All work is to be done in conformance with the aforementioned Codes and References.

END OF SECTION 15020

SECTION 15040 - TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 VERIFICATION:

A. All tests shall be verified by the Owner's Representative. The contractor shall test the operation of each safety and high limit control to insure proper installation and operation. Any defective devices shall be replaced.

1.3 TESTS AND ADJUSTMENTS:

A. Before any piping is covered, tests shall be made in the presence of the Owner's Representative and any leaks or defective work corrected. No caulking of threaded work will be permitted. Following minimum pressures shall be used for testing:

B. Before application of insulation covering, and as far as practical before concealing any piping, all piping shall be hydrostatically tested and proved tight. Stubs shall be capped and all control valves shall be removed during the test. System may be tested in sections, providing connections to last section tested are included in each succeeding test. Following minimum pressures shall be used for testing:

1. Water Piping - 50 PSIG for 4 hours.

2. Gas Piping - 50 PSIG for 4 hours.

3. Waste and vent piping - fill to 10' above highest level.

4. Compressed air piping - 125 PSIG for four hours

PART 2 - PRODUCTS

2.2 TEST EQUIPMENT:

A. The mechanical contractor shall furnish all necessary gauges, plugs, test fans, pumps, etc., as required to conduct the tests.

PART 3 - EXECUTION

3.1 PROCEDURE:

A. The contractor shall be responsible to conduct all tests in a safe manner, protecting the work of other trades from water or physical damage. The tests, as indicated, shall be in addition to any test as required by any governing agency. Submit all approved tests as required by any governing agency to the Owner's Representative. Each test and any necessary repairs and retest shall be performed by the contractor which installed the system.

3.2 REPORTS

A. The contractor shall give the Owner's Representative one week notice prior to performing the tests. All tests shall be witnessed and recorded, and reports given to the Owner.

END OF SECTION 15040

SECTION 15050 - BASIC PIPING MATERIALS AND METHODS

PART 1-GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION:

A. This section specifies the basic materials and methods to be used in Division 15.

B. All materials shall be new and undamaged. Protect all materials to keep free from foreign materials.

C. All materials shall be made in the United States, with a UL label. No foreign materials will be accepted.

1.2 CUTTING AND PATCHING

A. Any cutting, patching, or filling necessary for the proper execution of this work, except as noted on drawings, shall be done by this contractor. Where any other part of the building is involved, it shall be done by a competent workman in a neat and workmanlike manner. No rough or unsightly work will be allowed, and cutting of structural members shall be done only on approval of the Owner's Representative.

B. The attention of the contractor is directed to the requirements of running pipe through concrete slabs, walls, and beams. These conditions are to be anticipated and sleeves installed as provided for under "Sleeves". Sleeves shall be placed in structural members only where approved by the Owner's Representative.

1.3 PIPE SLEEVES AND COLLARS:

A. Pack sleeves in sound and fire partitions with US West approved fireproofing material and provide cover flange each side.

1.4 PIPE LOCATION AND ARRANGEMENT:

A. All piping shall be properly racked and supported to run straight and true. All changes in direction shall be made with approved fittings.

1.5 PIPE JOINING:

A. All joints shall be made to assure liquid-tight connections. Pipe shall be reamed at ends and free of all burrs. Clean the ends to be soldered with abrasive cloth, and apply non-corrosive flux. Solder with lead-free solder, "Silvabrite 100" or approved alternate. Underground copper pipe connections shall be brazed.

1.6 SCREWED CONNECTIONS:

A. All pipe shall be reamed at the ends and free of all inside scale or burrs. Threads shall be
cut clean and sharp, and to a length equal to 1-1/8 the length of the female thread receiving the pipe. The pipe shall be screwed in full length of the female thread.

1.7 PIPE GRADING AND SLOPE:

A. Piping shall be uniformly graded in direction of flow as noted below:

Piping	Fall/Rise	Direction	Per/Run
Water	1"	Up	40'
Waste	1/4"	Down	1'

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS:

A. Culinary cold water piping above grade shall be ASTM B88-78 Type "L" copper with soldered wrought copper fittings. The same piping below grade shall be Type "K". Solder fittings with lead-free solder.

B. Waste and vent piping shall be ASTM A74-82 no-hub cast iron.

C. Gas piping shall be shall be Schedule 40 ASTM A120-74 black steel piping.

D. Compressed air piping (Alternate No. 3) above grade shall be Schedule 40 galvanized piping.

E. ACR Refrigerant Piping:

a. Meet requirements of ASTM B 280-83, "Specification for Seamless Copper Tube for Air Conditioning & Refrigeration Field Service", hard drawn straight lengths. **Where tubing is used for furnace unit, the tubing shall be soft-drawn seamless, run continuous from the evap coil to the condenser without joints. Sizes, routing, traps, and details shall be by the equipment manufacturer.**

b. Pre-charged refrigerant lines not acceptable.

F. Refrigerant Fittings:

a. Wrought copper with long radius elbows.

b. Approved Manufacturers: Mueller Streamline

G. Suction Line Traps:

a. Manufactured standard one-piece traps.

H. Connection Material:

a. For Brazing - Sil-Fos

b. For Soldering - 95/5 or Sta-Bright.

c. Flux: Handy & Harmon.

I. Notes:

1. Do not install refrigerant piping underground or in tunnels.

2. Slope suction lines down toward compressor one inch/10 feet. Locate traps at vertical rises against flow in suction lines. **VERIFY WITH MANUFACTURER BEFORE INSTALLATION.**

3. Refrigeration system connections shall be copper-to-copper type properly cleaned and brazed. Use flux only where necessary.

   a. No soft solder connections will be allowed in system. If used, refrigerant piping will be rejected and will be required to be re-piped with new piping and brazed joints.

4. Braze valve, sight glass, and flexible connections.

5. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

6. Conduct tests at 70 deg. F ambient temperature or above.

7. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.

8. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.

J. Refrigerant System Specialties:

   a. Filter-Drier: On lines 3/4 inches outside diameter and larger, filter-drier shall be replaceable core type with non-ferrous casing and Schraeder type valve. On lines smaller than 3/4 inch outside diameter, filter-drier shall be a sealed type using sweat copper fittings. Size shall be full line size. Approved Manufacturers - Alco,Mueller, Sporlan, Virginia.

   b. Sight Glass: Combination moisture and liquid indicator with protection cap. Sight glass shall be full line size. Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed. Approved Manufacturers: Alco, Asco, Mueller, Sporlan.

   c. Manual Refrigerant Shut-Off Valve: Ball valves designed for refrigeration service and full line size. Valve shall have cap seals. Valves with hand wheels are not acceptable. Provide service valve on each liquid and suction line at compressor. If service valves come as integral part of condensing unit, additional service valves shall not be required. Approved Manufacturers: ConBraCo (Apollo), Henry, Mueller, Superior, Virginia.

2.2 VALVES AND STRAINERS

A. All valves and strainers shall be by one manufacturer. Approved valve manufacturers are Crane, Stockham, Jenkins, Walworth, W.C. Norris, or Powell. Crane numbers are used for convenience.

B. Domestic Hot and Cold Water

   1. Gate Valves Do not use gate valves; use ball valves.

C. Globe Valves

   1. Valves 1-1/2" and smaller shall be Crane No. 7TF, bronze, screwed, 200#, WOG globe valve with a replaceable teflon disc and teflon packing. The disc shall be suitable for hot water up to 360 degrees F. at 150 psi.

D. Check Valves

1. Valves 1-1/2" and smaller shall be Crane No. 37, bronze, screwed, Y-pattern 200# WOG swing check valve.

E. Ball Valves

1. For hot and cold domestic water service: Valves shall be Watts B-6000 for threaded joints and Watts B-6001 for soldered joints.

F. Strainers

1. Strainers 1-1/2" and smaller shall be Crane No. 988-1/2, iron body, screwed Y-pattern, 200# WOG, sediment separators with a 20-mesh Monel screen.

2.3 VACUUM BREAKERS

A. Vacuum breakers shall comply with requirements of the Utah State Plumbing Code for the actual installed duty.

1. Vacuum breakers shall be of the type, style, and arrangement approved by the Plumbing Code.

2.4 UNIONS

A. Ground joint unions shall be installed on pipe 2-1/2" and under where indicated on drawings. Whenever piping is connected to a major piece of apparatus, unions shall be provided as near as practical on each side of the apparatus.

2.5 ISOLATION FITTINGS

A. Approved isolation fittings shall be installed at the junction of all copper and steel piping to prevent electrolytic action. Fittings shall be as manufactured by Walter Vallett Co., Corrosion Services, or approved alternate.

2.6 HANGERS AND SUPPORTS:

A. Vertical Piping:

1. Attachment - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and to carry the weight of the pipe and contents. Stacks shall be supported at their bases.

B. Horizontal Piping:

1. Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging. Screwed pipe (IPS) shall be supported at approximately 8-foot intervals. Where piping is run adjacent to walls or steel columns, it shall be supported from steel brackets or vertical channel hangers.

2. Use unistrut brackets to attach to ceiling where called for on the plans.

C. Furnish all hangers, inserts, brackets, anchors, etc., and all auxiliary steel necessary for the installation. All supports shall be designed in accordance with the AISC Steel Handbook and painted with one with one coat of primer and two coats enamel.

D. Plumbers' tape, chain, or wire will not be permitted.

PART 3 - EXECUTION

3.1 TESTING:

A. All piping shall be tested in accordance with Section 15040 prior to applying insulation or concealing in partitions, wall, etc.

3.2 ACCESS:

A. All valves and equipment shall be located to allow easy access for inspection, test and balance, and operation.

B. Locate piping, valves, etc., to allow easy access to and maintenance of equipment.

END OF SECTION 15050

SECTION 15180 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

A. It is the intent of this Section of the specifications that all hot and cold surfaces of mechanical system components be insulated, unless specifically excluded herein, including existing.

B. Insulate all new heating water lines and existing heating water lines where insulation is disturbed for construction.

PART 2 - PRODUCTS

2.1 COMPLIANCE:

A. All insulation shall conform to the requirements of the building code and have a flame spread rating of less than 25 and smoke developed less than 50. Insulation shall be as manufactured by Johns-Manville, Owens-Corning, Armstrong, or Gustin Bacon.

2.2 WATER PIPING :

A. All piping shall be insulated with 2-piece heavy density pipe insulation having an average "K" factor of .25 BTU at 70 degrees F mean, with all-service jacket. Thickness of insulation shall be as follows:

B. Water piping: 1" thick.

C. Pipe insulation shall be mechanically fastened to pipe systems. The insulation shall be covered with an all-service jacket. Fittings shall be insulated with mitered segments of insulation material and finished with a 1/4" layer of insulating cement. Flanges and valves shall be insulated with removable and replaceable covers fabricated from oversized pipe insulation and finished with an all-service PVC jacket. Valves shall be insulated as specified for fittings.

2.3 ROUND AND RECTANGULAR DUCTS:

A. The exterior surface of all round and rectangular low pressure supply, return, fresh air, and combustion air ducts in unconditioned spaces shall be wrapped with one layer of 1-1/2" thick fiberglass, having an average "K" factor of .23 BTU at 75 deg. F. mean. The insulation shall meet standards NFPA No. 90A and No. 90B and shall have the Underwriters' Laboratories, Inc., label. Leave marker tag where balancing dampers exist so that they may be found under insulation.

2.4 REFRIGERANT PIPING INSULATION:

A. Flexible Foamed Pipe Insulation:

a. Thickness

1) ½ inch thick for one inch outside diameter and smaller pipe.

2) 3/4 inch thick for 1-1/8 through two inch outside diameter pipe.
3) One inch thick for 2-1/8 inch outside diameter and larger pipe (two layers of ½ inch).
4) One inch thick sheet for fittings as recommended by Manufacturer.

b. Approved Manufacturers:Insulation: Armaflex, Rubatex, CSG "Ultrafoam", Halstead "Insul-tube", Therma-Cel. Joint Sealer: Armaflex 520, BFG Construction Adhesive #105, Therma-Cel 950

c. Installation:

1) Insulation shall fit in snug contact with pipe and be installed in accordance with Manufacturer's recommendations. Stagger joints on layers insulation. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum. Seal joints in insulation. Insulate flexible pipe connectors. Provide six inch long, 20 gauge galvanized steel sleeve around pipe insulation at each support. Extend insulation through pipe support clamps. Insulation exposed outside building shall have "slit" joint seams placed on bottom of pipe and given two coats of gray adhesive finish. Insulate fittings with sheet insulation and as recommended by Manufacturer. The insulation shall be covered with an all-service jacket. Valves shall be insulated as specified for fittings.

2.5 OUTDOOR PIPING INSULATION COVERS

A. All outdoor insulation shall be jacketed with a minimum thickness of .016 inch aluminum. The insulation and aluminum shall be secured to place by a continuous friction type joint to provide a positive weatherproof seal long the entire length of the aluminum jacket. Then, an aluminum preformed strap containing a permanently plastic weatherproof sealant, shall be centered over each circumferential joint, and secured by tightening on a clip, or by use of separate ½ inch wide stainless steel banding (.015 inch minimum thickness).

PART 3 - EXECUTION

3.1 GENERAL:

A. The contractor shall provide a complete installation which is neat in appearance and functional. Remove all excess materials and packaging from job site.

3.2 INSULATION WORKMANSHIP:

A. All insulation shall be applied by specialists experienced in the field, and shall be neat in appearance. Neatness in appearance shall be equated to proper insulation application procedures.

END OF SECTION 15180

SECTION 15400 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 GENERAL CONDITIONS:

A. Complete installation of each fixture shall include trap and accessories with accessible stop or control valve in each hot and cold water branch supply line. Caulk between fixture and countertop with white silicone non-absorbent caulking compound. Point all edges.

B. Install fixtures and fittings per local codes and manufacturer's instructions. Do not use plastic flexible water piping.

PART 2 - PRODUCTS

2.1 P-1 WATER CLOSET

A. Kohler white K-3558 "Wellworth Lite PC", 1.5 gallon pressure tank flush, elongated bowl, close coupled tank, vitreous china. Kohler K4650 open front seat and cover, K-7637 3/8" angle supply and stop, Frost 7902-2 supply pipe.

B. Approved alternate by American Standard or Eljer. Moen Approved for trim.

2.2 P-2 WALL HUNG LAVATORY

A. Kohler K-2030, "Greenwich", 20" x 18" wall hung, vitreous china, dual front overflow, D-shaped bowl, 8" centers, Finesse K-13339-5-H with wrist blade handles and aerator, and 0.5 GPM flow restrictor, Chicago 327 open grid drain; chrome plated flexible supplies with loose key stops, cast brass P-trap with cleanout plug, concealed arm chair carrier with foot support. Provide Smith “Prime-Eze” tail piece trap primer for floor drain.

B. Approved alternate by American Standard, or Eljer.

2.3 P-3 MEDIUM DUTY FLOOR DRAIN

A. Smith 2010-A-B cast iron 6" diameter drain with slotted sediment bucket and medium duty nickel bronze grate, flashing collar, caulk outlet. Deep seal P-trap. Trap primer fitting.

B. Approved alternate by Josam, Wade, or Zurn.

2.4 P-4 FLOOR SINK

A. Smith Fig. 3001 4" deep, 12" square top, ½ grate.

B. Approved alternate by Josam, Wade, or Zurn.

2.5 P-5 EMERGENCY SHOWER/EYEWASH

A. Free standing eye-face wash and drench shower with stainless steel head operated by

pull rod with triangle handle and stay-open ball valve. Eye-face wash with stainless steel bowl operated by hand and foot stay open ball valve. Complete with alarm and light attachment with optional wall mounting bracket.

B. Western Model W9231-WP82855 with W9800 alarm and light attachment, or approved alternate by Haws, Guardian, or Bradley.

2.6 CLEANOUTS:

A. Floor type - Zurn Z-1420-2.

B. Wall Type - Zurn Z-1445-1.

C. Resilient Flooring - Zurn Z-1400-6.

D. Exposed drain lines - Zurn Z-1440-A.

E. General purpose - Zurn Z-1440-A.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install accordance with all codes and manufacturer's instructions.

END OF PLUMBING FIXTURES AND TRIM.

SECTION 15500 - FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

A. The work specified in this section shall be installed by none other than a recognized sprinkler contractor regularly engaged in this work. System shall be subject to the inspection and approval of city and county fire code officials. All work shall be coordinated with other subcontractors.

1.3 SCOPE:

A. The work includes but is not limited to the installation of a complete new system to accommodate the floor plan of the remodeled portion of the building. This includes bringing a new fire line from outside the building and installing a new sprinkler riser. This contractor shall do all cutting, core drilling, etc., as required to perform his work.

1.4 CODES AND STANDARDS:

A. Wet sprinkler system - N.F.C. #13 and #14 - U.B.C.

B. Sprinkler heads - N.F.C. #13

1.5 WORK BY FIRE PROTECTION CONTRACTOR:

A. This contractor shall furnish and install all labor, material, and equipment to make a complete and working fire protection system fully tested and approved.

PART 2 - PRODUCTS

2.1 PIPING:

A. All piping above ground shall be rated for fire sprinkling system service.

2.2 ALARM RISER:

A. The riser “tree” shall consist of a UL and FM approved alarm check valve, for either grooved or flanged piping. Include a trim kit which shall include, but not be limited to, gauges, valves, check valves, nipples, fittings, retard chamber, and pressure switch.

B. Approved manufacturers: Star Model F, or approved alternate by Reliable.

2.3 SPRINKLER HEADS:

A. All sprinkler heads shall be U.L. and FM approved. All piping shall be concealed in public areas and whenever possible in other areas. Heads in finished areas shall be chrome-plated recessed type heads with white canopies similar and equal to that manufactured by Reliable. Sprinklers shall be of the proper temperature rating. Location of sprinkler, head whenever reasonably possible, shall be symmetrical and coordinated with the ceiling pattern and lights. Furnish wire guards where required for protection.

B. Furnish twelve spare heads of each type and temperature rating used, properly boxed, with sprinkler head wrench.

2.4 TRIM:

A. Trim shall include, but not necessarily limited to, 10" chrome plated water gong, pressure gauge, testing bypass, and escutcheon plates.

2.5 FIRE DEPARTMENT CONNECTION:

A. Polished brass standpipe mount type with turn-down siamese connection and built-in check valve.

2.6 UNDERGROUND VALVE BOXES (IF REQUIRED):

A. Concrete box with traffic weight cast iron lid marked for service.

2.7 FLOW SWITCH:

A. Provide with built-in retard, retarding chamber, and dual set of contacts.

2.8 DRAINS:

A. Use angle type drains.

2.9 VALVES:

A. Valves used with below grade pipe shall be cast iron pressure type.

B. Post indicator valves shall be AWWA and UL listed, with standard indicator post flange and post similar and equal to Kennedy #5412 series with post extensions as required.

C. Shut-off valves may be butterfly or OS&Y.

D. Check valves shall be alarm check type.

E. Provide USC listed backflow preventer.

PART 3 - EXECUTION

3.1 PIPING:

A. Install interior lines exposed.

3.2 TESTS:

A. Upon completion of work of this Section and prior to acceptance, subject system to tests required by underwriter's checking agency and City and/or County, with representatives of Fire Department present. Furnish Engineer with copies of certificates required by testing agencies.

B. Test systems including yard piping at 200 psi for two hours with no visible leakage in above ground piping. Make tests at low point in system or zone being tested.

C. Test blanks shall have red painted lugs protruding beyond flange to clearly indicate their presence and be numbered to assure their removal when testing is complete.

END OF SECTION 15500

SECTION 15700 - HEATING/COOLING/VENTILATING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SCOPE:

A. The installation covers the furnishing and installing of cooling, heating, and exhaust systems, and all necessary trim and specialties, etc., as specified and shown on drawings and as required to provide the complete heating and cooling systems.

B. The contractor shall obtain a permit from the Utah State Department of Air Quality upon completion of the project.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

A. All equipment shall be the capacity at 4500 ft. elevation and type shown on the drawings. Equipment manufacturers shall be as specified.

2.2 HIGH EFFICIENCY FURNACES:

A. Upflow furnaces shall be factory assembled units certified by AGA and set up for natural gas, complete with blower section, vertical flow furnace section, steel casing, piped, and wired.

B. Blower section shall consist of cabinet, blower, and motor.

1. Cabinet shall be of 22 gauge minimum cold rolled steel and have finish coat of baked-on enamel.

2. Blower shall be Class 1, full DIDW, statically and dynamically balanced.

C. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish to match furnace.

1. Coil shall have aluminum fins bonded to seamless copper tubing.

2. Coil shall be ARI rated. Provide drains pans with connections at either end.

D. Filters shall be 1" thick throw-away type. **Provide furnace with air filter in return duct; do not use filters inside of fan cabinet.**

E. Automatic controls shall consist of:

1. 100% cut-off safety pilot.

2. Manual gas shut-off valve.

3. Operating automatic valve.

4. Solid state type fan and thermal limit controls.

5. 24 volt transformer.

6. Electronic ignition system.

7. Pressure switch safety for induced draft fan.

F. Blower shall be driven by motor with adjustable pitch V-belt drive or by a multi-speed direct driven motor. Vertical counter furnace section shall be enclosed in 22 gauge minimum enameled steel casing lined with foil covered insulation.

G. Heat Exchanger

1. Ceramic or glass coated, stainless steel, or 18 gauge aluminized steel.

2. 15 year minimum limited warranty.

F. Gas burners shall be aluminized steel. Rated at 90% minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.

G. PVC intake of outside air and PVC combustion product exhaust with sealed combustion, two pipe direct vent system with termination kit.

H. Approved Manufacturers: Carrier as shown on the plans, or approved equal by Day and Night, Bryant, Payne, Trane.

I. NOTES: Furnace Manufacturer's representative shall start up and check out furnace equipment as follows:

1. Verity proper gas orifice sizing for altitude.

2. Clock gas meter for rated input.

3. Verify and set gas pressure at furnace.

4. Check and measure temperature rise.

5. Check safety controls for proper operation.

2.3 AIR-COOLED CONDENSING UNITS:

A. SEER shall be 13.0 or higher. Charge with HCFC-22 or R-410A.

B. Condenser coil shall have aluminum plate fins mechanically bonded to seamless copper or aluminum tubes.

1. Provide coil guard for unit.

2. Units having side inlets shall have coil guards.

C. Fans shall be direct driven propeller upflow type.

1. Fan motor shall be two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.

2. Motors shall be resiliently mounted.

3. Each fan shall have a safety guard.

D. Units shall be operable down to 35 deg. F outdoor temperature with standard controls,

and each unit shall have a low-ambient kit. Compressor shall be of hermetic design with the following features. Each condenser unit shall have one compressor.

1. Externally mounted brass service valves with charging connection.

2. Crankcase heater.

3. Resilient rubber mounts.

4. Compressor motor overload protection.

5. Noise enclosure on compressor

6. Low ambient kit

E. Controls

1. Factory wired and located in separate enclosure.

2. Safety devices shall consist of high and low pressure cutout and condenser fan motor overload devices.

3. Unit wiring shall incorporate positive-acting timer to prevent shortcycling of compressor and shall prevent compressor from restarting for 5 minutes if power is interrupted.

F. Casing

1. Fully weatherproof for outdoor installation. Finish shall be weather resistant.

2. Openings shall be provided for power and refrigerant connections.

3. Panels shall be removable for servicing.

G. Expansion Valves

1. Stainless steel diaphragm and same refrigerant in thermostatic element.

2. Size valves to provide full rated capacity of cooling coil served.

3. Furnished by evaporator coil/condensing unit supplier and coordinated to provide bleed holes for system pressure equalization, if required.

H. All condensing units shall use the same refrigerant. Only one liquid line, one suction line, and one power connection shall be made to each unit. Provide charging valves. EER rating as defined by ARI shall be not less than 10.00.

I. Set each unit on neoprene isolation pads located at each corner and having a minimum size of 4" x 4" x 3/4" high, and anchor to pad.

J. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

K. Guarantee: Provide 5-year limited warranty on coil and compressor and two year limited warranty on parts; with permanent label on unit showing expiration date.

L. Approved Manufacturers: Trane, Carrier, Bryant, Day & Night, or Lennox.

2.4 CEILING MOUNTED EXHAUST FANS

A. Complete with acoustically insulated housing, AMCA seal and UL label, shatterproof integral backdraft damper with no metal to metal contact, true centrifugal wheels.

B. Entire fan, motors and wheel assembly shall be easily removable without disturbing housing. Suitably ground motors and mount on rubber-in shear vibration isolators. 2.9 sones or less.

C. Approved Manufacturers: Acme, Penn, Loren Cook, Greenheck.

2.5 PACKAGED MAKEUP AIR UNIT - ALTERNATE NO. 5

A. Unit to be completely factory assembled, piped, wired and test fired. All units to contain duct furnaces that are A.G.A and C.G.A. certified and conform with the latest ANSI Standards for safe and efficient performance. Units to be mounted on metal rails with lifting and anchor holes and suitable for slab or curb mounting. Units to be available for operation on natural gas. The firing rate of each furnace will not exceed 400 MBh and contains its own heat exchanger, flue collector, venting, burners, safety and ignition controls. All units to be ETL and CSA certified for electrical safety in compliance with UL 1995 safety standard for heating, ventilating and cooling equipment. All units to be in compliance with FM (Factory Mutual) requirements. Standard control relays socket mounted with terminal block connections.

B. All control wiring to terminate at terminal strips (single point connection) and to include an identifying marker corresponding to the wiring diagram. Motor and control wiring to be harnessed with terminal block connections. Casings to be die formed, 18 gauge galvanized steel and finished in air dry enamel. Service and access panels to be provided through easily removable side access panels with captive fasteners. Fan sections and supply plenums (when provided) to be insulated with fire resistant, odorless, matte faced 1" glass fiber material. Outside air hood to ship with a wire mesh inlet screen. Standard heat exchanger construction to consist of 20 gauge [1.0 mm] aluminized steel tubes and 18 gauge [1.3 m] aluminized steel headers. Standard drip pan construction to be corrosion resistant aluminized steel.

C. Standard flue collector construction to be corrosion resistant aluminized steel. Burners to be die formed, corrosion resistant aluminized steel, with stamped porting and stainless steel port protectors. Port protectors prevent foreign matter from obstructing the burner ports. Burners to be individually removable for ease of inspection and servicing. The entire burner assembly to be removed with its slide out drawer design. The pilot to be accessible through an access plate without removing the burner drawer assembly.

D. Filter rack shall be constructed of galvanized steel with access through the side service panel. Electrical cabinet to be isolated from the air stream with a non removable access panel interior to the outer service panel. Provide in this cabinet for component mounting, wire routing and high voltage isolation. Motor and control wiring to be harnessed with terminal block connections. Standard units to be provided with 24 volt combination single stage automatic gas valves, including main operating valve and pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, and adjustable pilot valve. Gas valves are suitable for NEC Class 2 use for a maximum inlet gas pressure of 0.5 psi (14" W.C.) [3.4 kPa] on natural gas.

E. Each duct furnace shall be provided with a 24 volt high temperature limit switch, a (redundant) combination gas valve and a fan time delay relay. The fan time delay relay delays the fan start until the heat exchanger reaches a predetermined temperature. It also allows the fan to operate after burner shutdown, removing residual heat from the heat exchanger. Double and triple furnace units to contain a reverse airflow interlock switch. The normally closed switch, when activated, causes the gas valves to close and continue blower operation. All units provided with a solid state ignition control system which ignites the intermittent pilot by spark during each cycle of operation. When pilot

flame is proven, main burner valve opens to allow gas flow to the burners. Pilot and burners are extinguished during the off cycle.

F. Standard Temperature Rise Furnace: Each duct furnace shall have a lower pressure drop across the heat exchanger, allowing higher air flow capacities and an 80% eff rating with delta T of 20-60F per furnace.

G. Air Handling Fans: Centrifugal fan to be belt driven, forward curved with double inlet, statically and dynamically balanced. The blower wheel to be equipped with a pillow block bearing assembly on the drive side. An access interlock switch to be installed in the blower compartment and will disengage the blower upon removing the service panel. An override is to be incorporated into the access interlock switch for serviceability.

H. Natural vent units to be provided with a vent cap designed for gravity venting. Outside air for combustion enters at the base of the vent cap through a protective grille, and products of combustion are discharged through the upper section of the flue vent cap.

I. Electronic Modulating Duct stat with Room override gas control to provide modulated heat output. An automatic valve in series with the modulating valve shall be provided to cycle the unit. Ignition is at full fire (100% input) and modulates the gas input from 100% to 40% rated input. Available for use with a duct thermostat with remote set point adjustment. Override room thermostat causes the unit to go to full fire when the room temperature falls below the override room thermostat's set point.

J. Heat exchanger tubes and headers shall be 20 gauge [1.0 mm] type 409 stainless steel. Burners and flue collector shall be 409 Stainless Steel.

K. All motors are ball bearing type with resilient base mount. Windings are Class "B", with service factors of 1.15.

L. Dampers are to be of the opposed blade type, constructed of galvanized steel with neoprene nylon bushings, blades to be mechanically interlocked.

M. Units with outside air to be provided with damper, two position spring return damper motor and controls. The motor to power the damper full open when the unit is on and full closed when the unit is off.

N. Drip pan to be 409 stainless steel.

O. Interlock Relay 24/115/230V Coil. Relay has a selectable coil voltage of 24, 115 or 230 volts and double pole double throw 10 amp contacts. Utilized as an auxiliary relay for general purpose duty.

P. A high pressure and a low pressure interlock switch and shutoff valve are to be provided for each furnace section. High/low gas pressure limits disengage heating upon detecting either low line pressure or high manifold pressure.

Q. Wall Mounted Remote Control Station: Provide 6 LED status lamps with System On/Off, Fan Auto/On, Heat Auto/Off, Cool Auto/Off Auxiliary On/Off switching and Modulating damper potentiometer mounting. Design for easy installation with plug in terminal block wiring and wall mounting bracket.

R. Hinged service access doors to be mounted to the access side of the Filter/Damper and Blower Compartments. The hinged service access door to include quick opening tool-less latches and full perimeter gasketing to assure a water tight seal and door stops to guard against closure while open. The remaining cabinets to be supplied with a standard removable door. The coil cabinet door to utilize a removable vertical split door allowing for coil access and field provided coil piping penetrations.

S. Double wall cabinet construction to be provided by the manufacturer on applicable filter / damper, blower, coil and plenum cabinets. The construction to consist of a 24 guage inner liner wall with 1" 1 1/2 LB density insulation. Access doors on the specified side will be hinged and of the same double wall design.

T: Manufacturers: Trane, Reznor.

2.6 FLUE VENTS

A. Double wall, prefabricated sectional type, of aluminum construction designed to handle combustion products of fuel being used. Provide with inspection cap as required by local code, roof flashing, and clean-out.

B. Height of flue above roof shall be as shown on drawings unless local code requires it be higher.

1. Approved Manufacturers: Ameri-Vent, Dura-Vent and Metalbestos.

C. Vent caps to be non-backdraft type for installation on top of flue, aluminum construction.

1. Approved Manufacturers: Ameri-cap, Breidert Type L, Triangle AFL and Acme Mastervent Type MVR.

2.7 GAS-FIRED UNIT HEATER

A. Heat exchanger to be aluminized steel with 18 ga. tubes and 16 ga. header plates.

B. Burner to be 18 ga. aluminized steel with type 430 stainless steel ribbon inserts.

C. Unit shall have adjustable louvers for air diffusion.

D. Gas and electrical components shall consist of not less than the following:

1. 24 volt combination gas valve, pressure regulator, safeties, and 115/24 volt control transformer.

2. Unit to be AGA certified.

3. Thermostat to be low voltage with fan auto/on/off switch so that fan can be operated manually if desired.

4. Intermittent pilot with non-100% shutoff.

E. Verify on schedule on plans if fan is to be propeller or centrifugal type.

F. Acceptable manufacturers are: Trane, Modine, Hastings, and Lennox.

2.8 DUST COLLECTION BAGHOUSE - ALTERNATE NO.. 2

1. Furnish a complete pulse-jet modular baghouse dust collector system as shown on the plans. The system shall be capable of providing continuous on-line cleaning for a volumetric flow of 7000 SCFM. The collector system shall operate at an air-to-media ratio 7:1.

2. The air will contain wood dust and wood shavings. Airstream temperature shall be between 60°F and 90°F.

3. The pulse-jet modular baghouse shall be supplied in factory-assembled units sized to meet airflow capacities and design requirements. Instruction manual and replacement

parts list shall be included.

4. The collector shall have a bolted and welded construction using 12 gauge HRS and designed for plus-or-minus 20" water gauge. It shall be supplied complete with pulse-jet pipework, 1" single diaphragm valves, pilot solenoid valves in NEMA 4 control boxes, 4" square x 3/16' wall square tubing compressed air manifold, 4" x 4" structural support legs with cross bracing, lifting lugs, and discharge hopper with 18" x 18" inside flanged discharge opening with a minimum angle of 60° from the horizontal. On the far side of the hopper shall be a quick-opening 22" diameter hopper access door for the hopper outlet. The compressed air reservoir shall be provided with 1" NPT pipe coupling at both ends for attachment of clean dry compressed air supply at 90-100 PSIG.

5. Round-shaped, snap-in collar filter bags made of 16 oz. Polyester felt material. The round bags and galvanized cages shall be secured to the 10 gauge plate tubesheet by a radial compressive force supplied by a stainless steel spring band in the bag cuff and the cage cap to provide an airtight seal between the bags ands the tubesheet. The filter bags shall be arranged in a vertical configuration, serviced from outside the collector through 25"x 77" clean air access doors held down by pressure tabs on the top of the collector outlined with angle iron roof railing and kick plate.

   a. Provide one extra set of filter bags.

6. The collector shall be controlled by a solid state printed circuit cleaning control. The cleaning control shall progressively energize pilot solenoid valves, which cause the corresponding diaphragm valve to send a pulse of compressed air into the blowpipe. The high pressure pulse will enter the inside of the bags, blowing dust from the surface of the media. One row of bags shall be cleaned per pulse. Dust will discharged from the hopper at the base of the collector.

7. Construction shall meet Seismic Zone 4 requirements, and wind load rating shall be 100 MPH.

8. Unit shall include hopper, legs, drum cover without gate, motor with starter and remote start/stop, control panel, and ladder pack from ground to platform.

9. Include explosion vent with cover.

10. Manufacturers: Torit-Donaldson, Micropulse, or Mac.

PART 3 - EXECUTION

3.1 COORDINATION:

A. All equipment and piping shall be arranged to allow for easy maintenance.

3.2 PROTECTION AGAINST THE ELEMENTS:

A. The Contractor shall, at all times, take reasonable and adequate precautions to protect his work and all stored materials and equipment from damage by the elements, including flooding, windstorms, etc., and shall not expose the work of any other Contractor to such damage.

3.3 ANCHORING:

A. All mechanical equipment shall be securely mounted. All outdoor units shall be anchored to concrete pads. Air handlers shall be anchored to the floor if floor mounted.

END OF SECTION 15700

SECTION 15800 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

2.2 WORK INCLUDED:

A. Work shall include ventilation, and duct systems, and all materials, equipment, and labor required to complete the system shown on plans and specified herein.

PART 2 - PRODUCTS

2.1 HVAC DUCTWORK:

A. Construct all ducts, plenums, etc., of the gauges specified below, unless otherwise shown. Sheets shall be free from blisters, slivers, pits, and imperfectly galvanized spots. Construct ducts using double or Pittsburgh corner seams. All seams shall be hammered and made airtight. Joints shall be caulked to prevent air leakage, using Duradyne or Hardcast sealers.

B. Duct construction details shall comply with the latest edition of the SMACNA "2002 Duct Construction Standards" manual. **Ducts shall be constructed as Seal Class "C" and 2" Pressure Class, unless otherwise indicated on plans.**

C. Flange-type systems such as Ductmate are approved. Such systems must be installed so that joints are true and airtight with gaskets or duct sealer. Flange bolts are to be installed with lock washers or jam nuts.

D. Round ducts and fittings shall be 20 gauge, United Sheet Metal Co., Metco, or Ventline. Fittings are to be constructed of 20 gauge zinc-coated steel with welded or soldered joints. All fittings shall be made by same manufacturer as the spiral lockseam conduit to facilitate a tight fit. All field joints shall be sealed with high pressure duct sealer.

E. **Vanes with 1" long trailing edge shall be installed in all 90E elbows**.

F. Sheet metal ducts shall be properly braced and reinforced with galvanized steel angles or other structural members, and where they protrude above roof, they shall be properly flashed. Internal ends of all clip joints shall be installed in direction of flow.

2.2 ACCESS DOORS:

A. As indicated on the drawings and as required by code, for proper access to dampers, filter access space, etc., provide and install sheet metal access doors of the size as noted or as required for proper access to the equipment.

2.3 AIR INLETS AND OUTLETS:

A. Furnish and install all diffusers, registers, and grilles shown and specified on the drawings. All units to have opposed blade balancing dampers. 22 ga. steel construction with white finish unless special finish is requested. Perforated-face supply diffusers are not allowed.

2.4 MANUAL VOLUME DAMPERS:

A. Dampers in ducts up to 16"/16" may be single blade butterfly type. Larger dampers are to be opposed blade, airfoil type. Nailor Series 1400 or equal by Krueger, Greenheck or Titus.

2.5 DUST COLLECTION SYSTEM DUCTWORK - ALTERNATE NO. 2

A. Duct size and gauge (galvanized steel):

1. 4" thru 6" dia. shall be 24 ga.

2. 7" thru 12" dia. shall be 22 ga.

3. 14" dia. and larger shall be 20 ga.

B. Duct Sealing: Seal all duct joints to (-)10" w.g.

C. Factory fabricated duct systems such as “Easy Duct” by Donaldson may be used based on prior approval information submitted to Engineer at least 7 days before the bid.

D. Flexible duct shall be rubber or neoprene material with steel wire helix, capable of minimum of (-)5" w.g.

E. Floor Sweep shall be factory fabricated and shall be Donaldson “Easy Duct” part no. 24804 or approved alternate.

F. Duct longitudinal seams may be double lock or welded.

G. Elbows and bens shall be a minimum of two gauges heavier than straight lengths of equal diameter, and shall have a centerline radius of two times the pipe diameter.

H. 90° elbows shall be of 5-piece construction for round ducts up to six inches in diameter and 7-piece for larger diameters. Bends less than 90° shall have a proportional number of pieces. Prefabricated elbows of smooth construction may be used.

I. Cleanout doors in ducts shall be shop-fabricated pullout type or slide type constructed in accordance with Figure 5-24 of the “Industrial Ventilation Manual of Recommended Practice”, latest edition.

J. Transitions in main ducts and branch ducts shall be tapered five units long for every one unit change in diameter.

K. All branches shall enter the main duct at the center of the transition at an angle of 30°. Connections shall be made to the top pr side of the transition, not below the horizontal centerline. No two branches shall enter directly opposite from each other.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Verify that the work of this section may be installed in accordance with all pertinent Codes, regulations, and plans & specifications.

B. Dust collection system shall be installed in accordance with latest edition of the “Industrial Ventilation Manual of Recommended Practice”.

END OF SECTION 15800

SECTION 15900 - AUTOMATIC TEMPERATURE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 QUALIFIED CONTRACTORS:

A. Only contractors who have been in the temperature control business for a minimum of 2 years and have completed at least 5 similar projects are qualified to bid this project.

1.3 SYSTEM DESCRIPTION:

A. The new system is to be low voltage programmable thermostats. All controls, space sensors, damper motors, enclosures, etc. shall be furnished and installed by the ATC contractor.

1.4 WORK INCLUDED:

A. The work shall include, but is not necessarily limited to, the following: The control system shall consist of all equipment for a completely installed system of automatic temperature controls and motor starting circuits for the new and existing portions of the building. Furnish and install actuator motors for all dampers.

B. Interlock air handling units with condensing units so that condensing unit cannot operate if it's associated fan is not running.

C. Interlock make-up air unit and paint spray booth so that the makeup air unit runs when the spray booth is energized. (Alternate No. 5.)

D. In addition to items listed above, provide the following:

1. Control wiring and conduits.

2. Programming, documentation, and instruction.

1.5 WORK TO BE PERFORMED BY OTHERS:

A. The electrical contractor shall furnish and install all single phase and multiphase electrical power wiring to magnetic starters and motors.

1.6 INSTALLATION BY TEMPERATURE CONTROL CONTRACTOR:

A. The temperature control contractor shall install all necessary electrical control wiring of all temperature controls, heating and ventilating equipment, motor starting circuit controls, and all electrical control interlock for same.

B. All line and low voltage electrical wiring shall be installed in EMT conduit, and comply with Division 16.

1.7 SUBMITTALS:

A. After award of contract, submit for approval four (4) copies of control diagrams. Submittal shall include complete diagrams and schematics showing control equipment, terminal identifications, materials list, and sequence of control.

B. Control submittals must follow the specifications format in an orderly and sequential manner. Complete submittal data shall be included on all items of equipment under the proper headings, with features called for in the specifications clearly identified. All control panels shall be drawn up to scale.

C. Control schematics shall be provided for each control sequence specified, with all components clearly identified. Below each schematic shall be a copy of the written control sequence which incorporate (by number or description) each control component shown on the schematic.

1.8 OWNER INSTRUCTION UPON COMPLETION OF PROJECT:

A. Upon completion of the project, the temperature control contractor's representative shall spend two hours as scheduled by the building's operating personnel to instruct them on the operation of the system.

1.9 GUARANTEE:

A. All components, parts, and assemblies shall be guaranteed against defects in materials and workmanship for a period of **one year** after acceptance. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations.

B. The material guarantee commences at the time of the acceptance and continues for the previously indicated duration.

PART 2 - PRODUCTS

2.1 SPACE THERMOSTATS:

A. Thermostats for furnaces shall be Honeywell or equal thermostat provided by furnace equipment manufacturer. All thermostats shall be located as shown on the plan. They shall be programmed with in accordance with Owner’s instructions. Thermostats shall have fan-run position also.

B. No thermostat shall be located on outside walls.

C. Mount thermostats 5'-0" above floor.

2.2 SAFETY EQUIPMENT

A. Each furnace shall have a 24 volt AC fire 'stat installed in the furnace. The fire stat shall turn the furnace system off in the event of fire.

B. To be furnished and installed by ATC Contractor.

2.3 CONTROL DAMPERS:

A. Control dampers in all applications shall be furnished and installed by Mechanical Contractor.

2.4 ACTUATOR/MOTORS:

A. Actuators to be furnished and installed by ATC contractor. Electric actuators shall be heavy duty, and sized with 150% of starting torque required to initiate opening a closed damper with air pressure against it. Voltage to be compatible with a Alerton system.

Coordinate with Mechanical Contractor. Honeywell or Belimo.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONTROL:

A. The control contractor shall show the Owner's Representative that all controls work functionally. The contract shall not be complete until this demonstration is made. Instruct the Owner in the proper calibration and operation of all equipment. The contractor shall demonstrate to the Engineer that all systems function as designed and shall take the system through all sequences using a portable PC connected to the DDC system.

3.2 SEQUENCE OF CONTROL:

A. FURNACES

1. The unit shall respond to the programmable thermostat in each space to provide cooling or heating based upon the occupied and unoccupied setpoints of the thermostat. Heating/cooling changeover shall be automatic. The fan shall run continuously during occupied hours. Setpoints shall be as required by the Owner for the various spaces. The units shall have factory installed internal controls to regulate the operation of the heating and cooling functions of the gas burners and compressors.

2. The motorized fresh air damper shall open whenever the supply fan is running, and shall close when the fan is off.

B. MAKE-UP AIR UNIT (ALTERNATE NO. 5)

1. The unit shall be programmed to run during occupied hours. The burner shall be staged to maintain space temperature and to maintain duct temperature when there is not a call for heating. The unit shall modulate the economizer dampers to provide fresh air cooling when the outside air is cool enough. The unit shall be interlocked with the paint spray booth so that the makeup air unit starts when the spray booth starts.

END OF SECTION 15900

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Supporting devices for electrical components.
   2. Electrical demolition.
   3. Cutting and patching for electrical construction.
   4. Touchup painting.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Installer Qualifications: All workmen doing electrical work shall be duly licensed with the required supervision in the State or Locality as legally required.
   1. Site Review: All electricians must carry their electrician's license with them and show it upon request.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical equipment installation with other building components.
   1. Verify all dimensions be field measurements.
   2. Minimize costs to resolve equipment and other conflicts by successfully concluding preinstallation conferences. Include the following:
      a. Review Division 15 shop drawings. Compare equipment electrical specifications with equipment schedule. Prevent Div 15 equipment encroaching on clearances required by NEC. Request clarification of conflicts prior to installation.
      b. Determine whether lighting fixtures and other electrical items conflict with the location of structural members and mechanical or other equipment.
      c. Coordinate connecting electrical service to components furnished in other sections of the specification or by the User. Verify electrical requirements including voltage, full load amps, and minimum wire ampacity prior to installing or purchasing the associated electrical equipment and wiring.

d. Review systems furniture electrical specifications and compare with wiring indicated. Request dimensional layout from furniture installer including electrical connection locations. Request clarification of conflicts prior to installation.

D. Coordinate electrical service connections to components of Owner's facilities.
1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of Owner providing electrical power and other services.
3. Notify Architect a minimum of seven days in advance of any proposed utility interruption and obtain approval prior to proceeding. Comply with requirements of the Owner, User, and Utility.

E. Coordinate communication service connections to components of Owner's facilities.
1. Coordinate installation and connection of exterior underground and overhead utilities and services.
2. Comply with requirements of authorities having jurisdiction.
3. Notify Architect a minimum of seven days in advance of any proposed utility interruption and obtain approval prior to proceeding. Comply with requirements of the Owner, User, and Utility.

F. Coordinate with Authorities Having Jurisdiction including: city, county, state, university, federal and other governmental authorities.
1. Obtain all permits (including excavation permits) prior to beginning construction.
2. Request inspections required by Authorities Having Jurisdiction in a timely manner and in order to comply with sequencing requirements.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

I. Powder-Driven Threaded Studs: Heat-treated steel.

J. Meter Sockets: Comply with requirements of electrical power utility company.

1. Housing: NEMA 250, enclosure.

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

C. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Existing Utilities: Locate and identify existing underground utilities in excavation areas or in demolition areas. Maintain services to areas outside demolition limits or excavated areas. When services must be interrupted, install temporary services for affected areas.

F. Manufacturer’s Instructions: Comply with manufacturer’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements indicated in the Contract Documents.

G. Record drawings and Shop Drawings: Mark up drawings daily during construction with changes or deletions in the scope of the project.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.
   1. Comply with NFPA 70. In addition, install supports within 12" of couplings, fittings, and boxes, with a minimum of two supports per 10 foot length of raceway. Install supports at each change of direction. Similarly support cables in cable trays or raceways as indicated; except, provide J-hooks to support cables.
   2. Support suspended conduit and cables independently from all other electrical or mechanical systems by attaching directly from building structure, unless prior approval in writing has been obtained from the Architect after engineering calculations have been submitted.
   3. Coordinate installation of supports so as not to interfere with the removal of ceiling tiles, the service of mechanical equipment, etc.
   4. Install bracing parallel to trusses, beams, joists, bridging, etc.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Support parallel runs of cables together on trapeze or bracket type hangers, either vertically or horizontally.

E. Size supports for multiple raceway and cable installations so capacity can be increased by a 25 percent minimum in the future.

F. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

G. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If supported directly from the building structure, attach box to framing on opposite sides of the box. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
   1. Install wrapped or coated RMC sleeves with 3 feet extending on each side through penetrations of foundations or concrete walls by RNC.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
   1. Wood: Fasten with wood screws or screw-type nails.
   2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
   3. New Concrete: Concrete inserts with machine screws and bolts.
   4. Existing Concrete: Expansion bolts. Drill holes in concrete so holes do not cut main reinforcing bars. Fill and seal holes drilled in concrete and not used.
      a. Obtain prior approval from project structural engineer prior to drilling prestressed or post-tension concrete slabs and beams.
   5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
   6. Steel: Welded threaded studs or spring-tension clamps on steel.
      a. Field Welding: Comply with AWS D1.1.
   7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
   8. Light Steel: Sheet-metal screws.
   9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load. Do not support electrical equipment or conduits with toggle bolts, moly-bolts, or screws in sheetrock or plaster. Do not support electrical equipment or conduit from tie wires.
   10. Do not use wooden plugs in concrete or masonry units for fastening conduits, tubing, boxes, cabinets, etc.

3.4 ACCESS DOORS

A. Install access panels where required by accessibility requirements of NEC for electrical installations such as junction boxes, ballasts, and other electrical equipment requiring access.

3.5 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

B. Gypsum Board Tenting: Apply to lighting fixture or electrical equipment penetrations of fire rated floor, ceiling and wall assemblies, unless product is UL listed with integral fire rating Perform tenting as specified in appropriate Division 9 section to reestablish the original fire-resistance rating of the assembly at the penetration.

3.6 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
   1. Relocate existing electrical devices, conduit or equipment that for any reason obstructs construction. Include any equipment having electrical connections that requires disconnecting and reconnection at the same or another location throughout the course of construction.
   2. Maintain in working condition all electrical equipment and apparatus in areas not remodeled.
   3. Temporary Partitions or Dust Barriers: Prevent the spread of dust and dirt to adjacent areas.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
   1. Include exposed equipment and installations made obsolete by new work.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove and legally dispose of demolished material from Project site.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

F. Remove conductors from raceway to the first active outlet or branch panels for vacated or unused circuits.

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
   1. Core drilling: X-Ray post-tension slabs prior to core drilling to assure that post-tension cables are not damaged.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
   1. Supporting devices for electrical components.
   2. Cutting and patching for electrical construction.
   3. Touchup painting.

B. Test all electrical work to ensure that they test free of mechanical and electrical defects.
   1. Comply with testing requirements of authorities having jurisdiction.
   2. Comply with Owner’s standards for testing in documents listed in “Quality Assurance”.

3.9 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.10 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

1. Remove labels that are not permanent labels.
2. Wipe surfaces of electrical equipment. Remove excess lubrication and other substances.
3. Clean exposed exterior and interior hard-surface finishes to a dust-free condition, free of stains, films and similar foreign substances.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. Product Data: For the following:

B. Field Test Reports: Submit written test reports to include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Grounding Conductors, Cables, Connectors, and Rods:
      a. Apache Grounding/Erico Inc.
      b. Boggs, Inc.
      c. Chance/Hubbell.
      d. Copperweld Corp.
      e. Dossert Corp.
      f. Erico Inc.; Electrical Products Group.
      g. Framatome Connectors/Burndy Electrical.
      h. Galvan Industries, Inc.
      i. Harger Lightning Protection, Inc.
      j. Hastings Fiber Glass Products, Inc.
      k. Heary Brothers Lightning Protection Co.
      l. Ideal Industries, Inc.
      m. ILSCO.
      n. Kearney/Cooper Power Systems.
      o. Korns: C. C. Korns Co.; Division of Robroy Industries.

p. Lightning Master Corp.
q. Lyncole XIT Grounding.
r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
s. Raco, Inc.; Division of Hubbell.
t. Robbins Lightning, Inc.
u. Salisbury: W. H. Salisbury & Co.
v. Superior Grounding Systems, Inc.
w. Thomas & Betts, Electrical.
x. VFC, Inc.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."

B. Material: copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:
1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

H. Copper Bonding Conductors: As follows:
1. Bonding Conductor: as noted on the drawings, stranded copper conductor. Comply with NEC minimum requirements.
2. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Sectional type; copper-clad steel.
1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch wiring.

C. Nonmetallic Raceways: Install an equipment-grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

D. Air-Duct Equipment Circuits: Install an equipment-grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

E. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment-grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

F. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

G. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.

3.3 INSTALLATION

A. Renovation Projects: Document existing ground system at the main service and at each separately derived system serving the renovated area. Correct deficiencies of existing grounding system that do not comply with requirements of this section.

B. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
   1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
   2. Interconnect ground rods with grounding electrode conductors. Uses exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
   3. Install minimum 2 ground rods in main switchboard rooms along with a visible connection to the ground rods.

C. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

E. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters, valves, or service unions. Connect to pipe with grounding clamp connectors.

G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

H. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

I. Metal Frame of the building where effectively grounded: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to metal frame of building. Exothermically weld grounding conductors to metal frame. Bond metal grounding conductor conduit or sleeve to conductor at each end.

J. Concrete encased steel reinforcing bar or rod in underground footings or foundations: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to reinforcing bar or rod. Exothermically weld grounding conductors to reinforcing bar or rod. Bond metal grounding conductor conduit or sleeve to conductor at each end.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   2. Make connections with clean, bare metal at points of contact.
   3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
   5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 SEPARATELY DERIVED SYSTEMS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of grounding electrode conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Do not ground system neutral conductor under any circumstances after it has been grounded at the service entrance disconnect except for separately derived systems. Interconnect or bond all grounding systems to the main system ground. Do not used neutral conductors for grounding equipment. Do not bond the neutral bus to distribution cabinets, except for separately derived systems.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:
   1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
   2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
   3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
   4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 16060

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide (0.08 mm thick by 25 to 51 mm wide).

B. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
1. Not less than 6 inches wide by 4 mils thick (152 mm wide by 0.102 mm thick).
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

C. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength: 50 lb (22.3 kg) minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
   4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.
   1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
   2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
   3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
   4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:
   1. Clean surfaces of dust, loose material, and oily films before painting.
   2. Prime surfaces using type of primer specified for surface.
   3. Apply one intermediate and one finish coat of enamel.

F. Paint fire alarm junction boxes red.

G. Circuit Identification Labels on Boxes: Install labels externally for all installed boxes prior to installation of conductors.
   1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
   2. Concealed Boxes: Plasticized card-stock tags.
   3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

I. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm) overall, use a single line marker..

J. Color-Coding of Secondary Phase Conductors: Color code switch legs, travelers and other wiring for branch circuits other than those listed below. Use the following colors for service, feeder and branch-circuit phase conductors:
   1. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 6 AWG:
      a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch- (25-mm-) wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

K. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
   1. Legend: 1/4-inch- (6.4-mm-) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
   2. Tag Fasteners: Nylon cable ties.
   3. Band Fasteners: Integral ears.

L. Apply identification to conductors as follows:
   1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
   2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
   3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

M. Apply warning, caution, and instruction signs as follows:
   1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
   2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
   3. Install caution signs for enclosures Over 600 V: Indicate system voltage on black, preprinted on orange field.

N. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high lettering on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
   1. Interior and exterior of panelboards, electrical cabinets, and enclosures.
      a. Distribution Panelboards: Identify Distribution Panelboard designation and circuit serving distribution panelboard; label main and distribution overcurrent protection showing load served and location (identify room numbers).
      b. Branch Panelboards: Identify distribution panel and circuit serving panelboard.
      c. Main Overcurrent Protection: Identify main device and service disconnects.
   2. Access doors and panels for concealed electrical items.
   3. Electrical switchboards.

O. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.
   1. Existing Panelboards: identify existing circuits as well as new circuits in new framed, typed circuit schedules.

END OF SECTION 16075

SECTION 16110 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes wire, cable, connecting devices, patch cords, racks, installation, wire management, and testing for wiring systems to be used as signal pathways for voice and high-speed data transmission.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. LAN: Local area network.

D. PLENUM CABLE: Listed for use in air-handling spaces.

E. PVC: Polyvinyl chloride.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. General: Include data pertaining appurtenances and accessories:

1. Comply with Division 1 section “Submittals”. Include minimum of ten (10) 3-ring binders.
2. Properly mark specific service or function, and intended location of use within project (i.e., voice BDC and IDC termination).
3. Clearly identify or highlight to indicate applicable items.
4. Properly mark with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

B. Product Data: Include data on features, ratings, and performance for each component specified, including but not limited to:

1. Each type of cable.
2. Each type of cable connector.
3. Each type of patch panel.
4. Each type of wire management.
5. Complete outlet assembly including frame, jacks, and cover plate.
6. Each type of identification label.

C. Shop Drawings: Include dimensioned plan and elevation views of each individual component. Show equipment assemblies, method of field assembly, workspace requirements, and access for cable connections.

1. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by Owner.
2. Wiring diagrams. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.
    d. Fiber-optic boxes.

D. Cable Administration Drawings: As specified in Part 3.

E. Samples: For workstation outlets, jacks, jack assemblies, and faceplates for color selection and evaluation of technical features.

F. Product Certificates: For each type of cable, connector, and terminal equipment, signed by product manufacturer.

1. Certify that the cables are suitable for the connected equipment.
2. UL labeled and/or listed.
3. Clearly identify transmission parameters specified (reference category 5 or higher rating).

G. Manufacturer Seismic Qualification Certification: Submit certification that distribution racks and their components will withstand seismic forces. Include the following:

1. Basis for Certification: Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based. Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity of each rack-mounted component and of each assembled rack type, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

H. Qualification Data:
1. Installer must show proof of current certification of the Siemon Cabling System via an updated card given after attending the five day recertification classs.
2. Installer must be trained and certified in fiber optic cabling, splicing, termination and testing techniques. Must have experience using a light meter and OTDR
3. Must be trained in the installation of pathways and support for housing horizontal and backbone cabling.

I. Provide list of test equipment to be used including documentation indicating that the proposed equipment is capable of performing all of the tests required.

J. Field quality-control test reports.

K. Operation and Maintenance Data: For voice and data communication cabling to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. The Utah National Guard (UTNG) desires to have Telecommunication parts installed in accordance with Industry Standard TIA/568B. All projects must be coordinated and approved through the UTNG State Telecommunications Manager (Mike Hansen, 801-523-4118) to

ensure that industry standards are adhered to. All telecommunication work to be done on any Utah Army National Guard Facility will be coordinated and approved though Mike Hansen (pager # (801) 249-3838) or Toby Adamson (pager # (801) 241-9942). Layout for telecommunication closets will be as followed. There will be 1 or more sheets of ¾ inch plywood placed on the wall of the telecommunication closet. From left to right the positioning of the metal backboards will be Green, Blue, and Yellow. You will leave proper space between the blue and yellow boards to accommodate future growth. Along the bottoms of each of the backboards you will install full spool boards. On the Green backboard you will install the copper feeds for the building. The copper feeds will be terminated to lighting protection and then to the Siemon 24 port patch panel. On the Blue backboard, the Blue Commscope CAT 5E 55N4R BL***, will be terminated to the Siemon HD5-89D-12 *** patch panel. On the Yellow backboard, the Yellow Commscope CAT 5E 55N4R YL***, will be terminated to the Siemon HD5-89D-12 *** patch panel. There will be one blue and one yellow CAT 5 or CAT 6 wire pulled to each location. They will correlate with the same number on the patch panel (ex. Jack 101 will have one blue and one yellow wire that will be in the same location on the patch panel.). Fiber will be terminated in an LIU can. Termination of fiber will be either ST or SC. This will depend on location. You will need to speak with Mike or Toby in order to know what facility has what termination.

** This equipment is being used in the Draper facility
*** There are some Facilities that have CAT 6 horizontal cable. You will have to speak with Mike or Toby in order to know what is required at each Facility.

B. Installer Qualifications: System installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.

1. Factory Certification: Perform installation with factory trained and certified technicians by the manufacturers of the cabling system to be installed.
2. Pre-approved Installers: Subject to compliance with contract documents, installers approved for this project are as follows:

a. Americom Technology.
b. Cache Valley Electric
c. Federal Communications Group.
d. Lumix Communications
e. Niels Fugal & Sons Company.

C. Source Limitations: Obtain generic type of products through one source from a single manufacturer, except for the following:

1. Wire Management.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NFPA 70.

F. Comply with FCC Part 68, Chapter 1, “US Code of Federal Regulations, “Title 47 for all telephone system wire and cable connection components.

G. Comply with latest EIA/TIA, UL, IEEE, and ICEA standards for structured cabling products and installation.

1. "Commercial Building Wiring Standard:" EIA/TIA 568.
2. "Commercial Building Standard for Telecommunications Pathways and Spaces:" EIA/TIA 569.
3. "Color Marking of Thermoplastic Wire:" EIA-230.
4. "Commercial Building Telecommunications Wiring Standards": TSB 40.
5. "Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems": TSB 67.
6. Standards pertaining to optical-fiber cable and system component construction and installation: EIA-440, -455, -458, -475, and –509.
7. Certified type PCC FT4 FT6 for plenum cable.
8. ICEA S80-576.
9. UL Subject 444

1.6 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with Owner's telecommunications and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. All work must be coordinated thru the UTNG State Telecommunications Manager (Mike Hansen, pager 801-249-3838) to ensure that industry standards are followed.
2. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
3. Record agreements reached in meetings and distribute to other participants.
4. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

1.7 WARRANTY

A. Special Project Warranty: Manufacturer's standard form in which manufacturer of structured cabling system and the principal installer agree to replace and install structured cabling components that fail in materials or workmanship, or do not meet manufacturer's official published specifications and performance criteria within the Special Project Warranty Period specified below. This includes labor and materials. This warranty shall be in addition to, and not a limitation of, other rights and remedies the Owner may have against the Contractor under the Contract Documents.

1. Warranty Period: 20 years minimum from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cable: 500 feet (76 m) of each size and type used for Project. Furnish on reels.
2. Outlet Assemblies: One of each type for every 25 installed, but no fewer than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cable:

    a. Commscope.

2. Terminal and Connector Components:

    a. The Siemon Company.

3. Distribution Racks and Wire Management:

    a. The Siemon Company.

2.2 EQUIPMENT/CABLING LIST

A. Equip the system with items identified in the Equipment/Cabling List. Do not construe this list as a "bill of materials". This list identifies items of significance used during the design of the cabling installation. Where the items indicated are one portion of an assembly, provided entire assembly unless specified otherwise.

1. Siemon HD5-89D-12 Patch Panels.
2. Siemon HD6-89D-12 Patch Panels. ***
3. Siemon S210MB2-192 **
4. Siemon S188-300 Vertical Wire Management **
5. Siemon S188WD Horizontal Wire Management **
6. Siemon S110M-WM-300 Vertical Wire Management **
7. Siemon S210MB2-300 **
8. Siemon S210C-4 **
9. Siemon CT-5-C5-02 Angled Jack.
10. Siemon CT-C6-C6-02 Angled Jack. ***
11. Siemon CT2-FP-02 Faceplate.
12. Siemon CT MuTOA CT-MMO-02
13. Siemon SPB-V1 24 Port Patch Panel.
14. Commscope CAT 5E Blue 55N4R BL
15. Commscope CAT 5E Yellow 55N4R YL
16. Commscope CAT 6 Blue 75N4 BL ***
17. Commscope CAT 6 Yellow 75N4 YL***
18. Green Backboard Metal M183 B2 (VAR)
19. Blue Backboards Metal M183 B1 (VAR)
20. Yellow Backboards Metal M183 B5 (VAR)
21. Full Spool boards. M187 B1 (VAR)
22. Marconi R66P25QC Lighting Protection Panel.
23. Marconi R66P50QC Lighting Protection Panel.
24. Marconi R66P100QC Lighting Protection Panel.
25. SECOR WIC 012 LIU can.
26. Siemon Rack Mount LIU FCP3-Rack. **
27. Gas Protection Fuses 104410147

MDF (Main Distribution Frame) for AGCW
Standard Equipment:

1. AVAYA 107894966 100 Pair Lighting Protection 110 termination style.
2. SECOR CCH03U 72 Strand Rack Mount LIU.

The MDF at AGCW is in building 617. To gain access to this area you will have to contact Mike Hansen at (801) 249-3838 or Toby Adamson at (801) 241-9942. **All work to be bid on or done at AGCW** will contact Mike or Toby prior to starting.

IDF (Intermittent Distribution Frame) for AGCW
Standard Equipment:

28. Siemon HD5-89D-12 Patch Panels.
29. Siemon HD6-89D-12 Patch Panels. ***
30. Siemon CT-C5-C5-02 Angled Jack.
31. Siemon CT-C6-C6-02 Angled Jack. ***
32. Siemon CT2-FP-02 Faceplate.
33. Siemon CT MuTOA CT-MMO-02
34. Siemon SPB-V1 24 Port Patch Panel.
35. Commscope CAT 5E Blue 55N4R BL
36. Commscope CAT 5E Yellow 55N4R YL
37. Commscope CAT 6 Blue 75N4 BL ***
38. Commscope CAT 6 Yellow 75N4 YL***
39. Green Backboard Metal M183 B2 (VAR)
40. Blue Backboards Metal M183 B1 (VAR)
41. Yellow Backboards Metal M183 B5 (VAR)
42. Full Spool boards. M187 B1 (VAR)
43. Marconi R66P25QC Lighting Protection Panel.
44. SECOR WIC 012 LIU can.
45. Gas Protection Fuses 104410147

2.3 SYSTEM REQUIREMENTS

A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, provide positions in cross-connect, patch panels, and mounting space on each backboard or in each rack to accommodate 20 percent future increase in outlets of each type.

C. Equipment Capability: Unless otherwise indicated, provide 100% of patch panel and wire management space in each rack for owner furnished equipment.

2.4 MOUNTING ELEMENTS

A. Raceways and Boxes: Comply with Division 26 Section "Raceways and Boxes for Electrical Systems."

B. Backboards: 3/4-inch (19-mm), interior-grade, painted fire-retardant-treated plywood floor.

C. Distribution Racks: Modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.

2.5 IDENTIFICATION PRODUCTS

A. Comply with Division 26 Section "Identification for Electrical Systems" and the following:

1. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Refer to Division 26 drawings for additional locations of outlets, communication rooms, and cable trays.
2. Provide inner duct for all fiber optic cables installed in cable tray, loose, or in conduit with diameters in excess of 1.5 inches.

3.2 APPLICATION OF MEDIA

A. Horizontal Cable for Data Service: Refer to drawings for cable for runs between wiring closets and workstation outlets.

B. Horizontal Cable for Voice Service: Refer to drawings for cable for runs between wiring closets and workstation outlets.

3.3 INSTALLATION

A. Wiring Method: Install wiring in raceway and cable management systems except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

1. Where raceways are not provided, install cabling in accessible ceilings, minimum 18” above suspended ceiling. Support cable a minimum of every 30” from the building structure. Do not support cable from suspended ceilings. Install cables above accessible ceilings in common areas and corridors to the furthest possible point for convenient access.

B. Install cables using techniques, practices, and methods that are consistent with Category rating of the cable installed and that ensure the performance of the completed and linked signal paths, end to end, of the category rating indicated.

C. Install cables without damaging conductors, shield, or jacket.

D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.

E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

1. Pull cables simultaneously if more than one is being installed in same raceway.
2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.

F. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.

G. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

H. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use wire distribution spools at points where

cables are fanned or conductors turned. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer. Connect conductors that are terminated, spliced, or interrupted to terminal blocks. Label each terminal with designations approved by the Owner. Install wiring on racks and at wall mounted connection blocks through wire management devices.

I. Separation of Wires: Comply with TIA/EIA-569-B rules for separating unshielded copper voice and data communication cabling from potential EMI sources, including electrical power lines and equipment.

1. Do not install structured cabling within 12” of power and lighting wiring, or within 12” of a fluorescent lighting and electrical fixtures.

J. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

K. Use splice and tap connectors compatible with media types.

L. Riser Cables: Install all riser cables through 5” sleeves. Support riser cable through sleeves at a minimum of even floor number intervals. Select support system based on site conditions and weight of cable.

3.4 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Ground and bond all equipment racks and wall fields. Provide grounding connections for cable and other system components as required by manufacturer’s written instructions and TIA/EIA 607, “Grounding and Bonding of Telecommunications Systems”.

1. Terminate all ground conductors to ground terminals or ground buses in equipment rooms and wiring closets.
2. Conductors: #6 AWG, THWN, Copper, color coded green.

C. Signal Ground Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.

D. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.

E. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

A. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.

B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.

C. Group connecting hardware for cables into separate logical fields.

D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

3.6 INSTALLATION STANDARDS

A. Comply with requirements in TIA/EIA-568-B and TIA/EIA-569-B

3.7 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and TIA/EIA-606-A.

B. System: Use a unique, three-syllable, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

1. First syllable identifies and locates equipment room or wiring closet where cables originate.
2. Second syllable identifies and locates cross-connect- or patch-panel field in which cables terminate.
3. Third syllable designates type of media (copper or fiber) and position occupied by cable pairs or fibers in field.

C. Workstation: Label cables within outlet boxes.

D. Distribution Racks and Frames: Label each unit and field within that unit.

E. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Cables, General: Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

G. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).

H. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project, in software and format selected by Owner.

1. Provide cable records on an automated dBase or Excel compatible program. Establish fields for recording of active and inactive cable pairs to be input by Owner’s personnel at a later date. Correlate WSI number, distribution cable number, punch down block or frame assignments, conduit or duct path and station location. Update record as the project progresses to reflect required changes.

I. Cable Administration Drawings: Show building floor plans with cable administration point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606. Furnish electronic record of all drawings, in software and format selected by Owner.

1. Drawing Format: AutoCAD 2000.

3.8 FIELD QUALITY CONTROL

A. Perform testing as required for Siemon 20 year warranty and provide reports to owner personnel.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets. Refer to Division 1 Section "Closeout Procedures."

1. Include a description of the systems, a tour of the facilities, and a tutorial on using the cable testers and documentation software.
2. Include sufficient level of training to the Owner’s staff to allow for installation and maintenance to be carried out to the manufacturer’s specifications.
3. Subsequent to hookups of telephone/data distribution systems, operate control/signal systems to demonstrate proper functioning. Replace malfunctioning media with new materials, and then retest until satisfactory performance is achieved.
4. Documentation: Use the above time domain reflectometer to make a strip chart recording of transmission characteristics, wave form, and performance of all segments of the installation at the time of commissioning. Also, use an optical loss test set (OLTS) to measure the optical transmission loss on each optical fiber path in the system. Record loss data in a form with provision for at least 50 additional loss data entries during future maintenance operations. Bind the recordings in a cable record book indexed for easy reference during future maintenance operations and turn book over to the Owner’s authorized representative.

END OF SECTION 16110

SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

1.4 QUALITY ASSURANCE

A. Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:
   1. Copper Wire and Cables:
      a. Alcan Aluminum Corporation; Alcan Cable Div.
      b. American Insulated Wire Corp.; a Leviton Company.
      c. General Cable Corporation.
      d. Senator Wire & Cable Company.
      e. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Insulation Types: Type THWN-2 complying with NEMA WC 5 .

D. Multiconductor Cable: Metal-clad cable (Type MC), with ground wire.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:
1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Burndy.
4. Hubbell/Anderson.
5. Ilsco.
6. O-Z/Gedney; EGS Electrical Group LLC.
7. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THWN-2, single conductors in raceway.Exposed Branch Circuits, including in Crawlspaces: Type THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THWN-2, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THWN-2, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits:
1. Type THWN-2 in raceway for fire alarm power circuits, for horn circuits, and for strobe circuits.

K. Emergency circuits: Install in separate raceways from all other wiring, except where they connect to the same equipment for two-source operation.

L. Class 1 Control Circuits: Type THWN-2, in raceway.

M. Class 2 Control Circuits: Type THWN-2, in raceway.

N. Fixture Conductors: Install conductors in lighting fixtures with insulation ratings as recommended by the manufacturer's written instructions or a minimum 90 degrees C., whichever is higher.

O. Communication Conductors: Install communication conductors in raceway.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Multi-wire branch circuits: install no more than three circuits in a raceway, unless specifically shown otherwise. Install #10 conductors for branch circuits for which the distance from panelboard to furthest outlet is more than 100' for 120 volt or more than 140' for 277 volt circuits.

C. GFI circuit breakers or feed-thru outlets to outlets served: provide separate neutrals.

D. Panelboards, switchboards, MCCs, switchgear: Do not route conductors through a section which terminate in another section, except for interconnecting control conductors.

E. Remove existing conductors from raceway before pulling in new wires and cables.

F. Parallel conductors: Where parallel conductors are installed in parallel raceways, install in each raceway conductors of phase, neutral and/or ground as specified. Carefully cut parallel conductors to identical length for each phase leg. Do not parallel conductors less than #1/0.

G. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

H. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

I. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

J. Do not install wiring through any part of a transformer vault or elevator equipment room and shaft that is does not serve equipment in the respective room. Also, coordinate that piping or other items foreign to the transformer vault, elevator equipment room or shaft is not installed in these spaces.

K. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."

L. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

M. Identify and color-code conductors and cables according to Division 16 Section " Electrical Identification."

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Conductor splices: Minimize conductor splices. Do not install in conduit bodies.

C. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors. Install compression type connectors for aluminum conductors or copper pigtail adapters for installation in mechanical lugs.

D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

E. Furniture connections: connect systems furniture to power supply circuits per manufacturer's written instructions.

F. Panelboard connections: do not splice conductors in panelboards.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:
   1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
   2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:
   1. Division 16 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.
   2. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
   3. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
   4. Division 16 Section "Seismic Controls for Electrical Work" for seismic restraints and bracing of raceways, boxes, enclosures, and cabinets.
   5. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. LFNC: Liquidtight flexible nonmetallic conduit.

F. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturer:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

E. Plastic-Coated IMC and Fittings: NEMA RN 1.

F. EMT and Fittings: ANSI C80.3.

1. Fittings: Steel compression type. Do not use die-cast fittings.

G. FMC: Zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings: NEMA FB 1; compatible with conduit and tubing materials. Do not use die-cast fittings.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturer:
1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

D. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Manufacturer:
1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA .

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged covers.

F. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating
1. Manufacturer:
a. Thomas & Betts Corporation.
b. Monosystems.

c. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturer:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

F. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 EXPANSION FITTINGS:

A. Manufacturer:
1. O-Z Gedney; Unit of General Signal.

B. Expansion Fittings: Malleable Iron, hot dipped galvanized, weatherproof suitable for raceway and applications
1. Coordinate expansion requirements with Architect.

2.8 FACTORY FINISHES

A. Finish: provide manufacturer's standard prime-coat finish ready for field painting for:
1. Raceways

B. Finish: provide manufacturer's standard paint applied before shipping to factory-assembled products for:
1. Enclosures: Standard Grey in electrical rooms,.
2. Cabinets: Standard Grey in electrical rooms,.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:
1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC (except coated or wrapped rigid steel for bends greater than 22 degrees), coated or wrapped rigid steel.
4. Underground, Grouped: RNC (except coated or wrapped rigid steel for bends greater than 22 degrees), coated or wrapped rigid steel.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:
1. Exposed:
   a. Above 6' from finished floor: EMT, IMC, or Rigid Steel.
   b. Below 6' from finished floor, or subject to mechanical damage: Rigid Steel.
2. Underground: refer to underground installation selections in outdoor paragraph above.
3. Concealed: EMT, or Rigid Steel.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Damp or Wet Locations: Rigid steel conduit.
6. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size:
1. Metallic Conduits: 3/4-inch trade size (DN 21) except ½" C trade size (DN 16) for low voltage automatic temperature control or motor control wiring.
2. Nonmetallic Conduits: 3/4-inch trade size (DN 21).

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Metal Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated. Engage a minimum of five full threads.
2. Intermediate Metal Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated. Engage a minimum of five full threads.
3. PVC Externally Coated or wrapped Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
4. EMT: set screw or compression for dry interior locations; compression for damp or wet locations; compression with tape for installations in concrete slabs above grade.
5. Building Expansion joints: use expansion fittings with 36" of wrapped metal raceways on either side of joint.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

A. Layout of electrical boxes: Do not scale electrical drawings.
1. Coordinate with architectural elevations. Where outlets are not identified on the elevations, refer mounting height decisions to the Architect. If counters or work surfaces are shown refer mounting height decisions, whether above or below counter, to the Architect. Coordinate location of switches with actual door swings.
2. Verify final locations with field measurements and with the requirements of the actual equipment to be connected as determined from shop drawings.

3. Refer to mounting height detail sheet for typical elevations.
4. Mounting heights indicated in the symbol schedules are to the center of the outlet.
5. Mounting heights indicated on the drawings for wall mounted lighting fixtures are to the center of the lighting fixture.
6. Mounting heights indicated on the drawings for pendant mounted lighting fixtures are to the bottom of the lighting fixture.
7. Mechanical and equipment rooms. Coordinate location of lighting and power outlets with duct and equipment locations. Do not install outlets behind equipment or where otherwise inaccessible. Position lighting, regardless of where shown on drawings, to provide proper illumination.
8. Mount outlet boxes for switches and receptacles with the long axis of the device vertical unless otherwise indicated.
9. Set boxes with plaster-rings flush with finished surface.
10. Install boxes on opposite sides of wall with a stud and a minimum 10” between them.
11. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally.

B. Existing boxes: Install new plaster rings or extension rings for existing boxes not flush with surface.

C. Outlet Boxes:
1. Frame construction: 4”X4”X1-1/2” with suitable plaster-ring, except:
   a. 2-1/8” deep for boxes with 3 conduit entrances or for communication outlets
   b. 4-11/16” boxes for boxes with 4 or more conduits.
2. Masonary or concrete construction: 1g or multiple gang by 3-1/2” deep.
3. Fixture Outlets: minimum 4” outlet box with 3/8” fixture stud supported adequately for minimum of 200 lbs.
4. Do not use gangable boxes.

D. Keep raceways at least 12 inches (300 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Complete raceway installation before starting conductor installation.

F. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

G. Install temporary closures to prevent foreign matter from entering raceways.

H. Stub-ups: Embed coupling flush with finished floor. If to remain a spare, the flush plug is to remain in the coupling.

I. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated. Make bends in parallel or banked runs from same centerline to make bends parallel.
1. Nonmetallic Conduits: Use rigid elbows for all bends 22 degrees or greater.
2. Communication Systems Raceways: comply with long sweep radius elbows minimum dimensions in Table 5.2-1 of ANSI/TIA/EIA-569A for all bends or offsets for backbone cables.

J. Raceways below grade: Install RNC or wrapped/coated Rigid Steel minimum 24” below grade, unless specifically noted otherwise. Where noted encase in concrete.

K. Conceal conduit and EMT within finished walls, ceilings, and floors, except at surface mounted panels and apparatus or unless otherwise indicated. Install surface raceways only where indicated or where directed by Architect.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
2. Install surface raceways in rooms where surface mounted panels are indicated or for exposed equipment in mechanical, electrical, or communication rooms.

L. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
1. Maximum conduit size: Lesser of 1-inch trade size (DN 27) or 1/3 the concrete cover.
   a. For conduits larger than 1-inch trade size (DN 27), consult structural engineer for additional structural supports or other options.
2. Layout: Route conduits without crossovers. Space conduit at least 18" apart. Space raceways laterally to prevent voids in concrete.
   a. Where concentrations of conduit occur, support slab independent of steel deck. Coordinate with structural engineer.
3. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
4. Install taped compression type fittings or fittings approved for such use.
5. Change from nonmetallic tubing to rigid steel conduit before rising above the floor.

M. Raceways Penetrating foundation walls: Install rigid conduit through the foundation wall or 3' each side.

N. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

O. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors.

P. Tighten set screws of threadless fittings with suitable tools.

Q. Cap open ends of empty conduit to keep out debris until the project is completed.

R. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. For RMC and IMC, use two locknuts, one inside and one outside box and a bushing. For EMT, use insulated throats or plastic bushings (except for grounding bushings where required).
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
3. Service Conduits or conduits installed in concentric/eccentric knock-outs or reducing washers: terminate raceway with grounding bushings.

S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Plug empty raceways at both ends.

T. Low Voltage, Telephone, and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

U. Install seals for conduit penetrations of slabs on grade and exterior walls below grade. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

V. Roof Penetrations: Install flashings for conduit penetrations of roofs under the direct supervision of the roofing installer.

W. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where conduits pass through airtight spaces or plenums to prevent air leakage.
3. Where conduits pass from hazardous areas to nonhazardous.
4. Where otherwise required by NFPA 70.

X. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Y. Raceway Cleaning: Prevent accumulation of water, dirt or concrete in raceways. Where water or foreign matter have entered raceways, thoroughly clean or replace conduits where such accumulation cannot be removed by methods approved by this Engineer.

Z. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

BB. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Single and duplex receptacles, ground-fault circuit interrupters, and isolated-ground receptacles.
   2. Single- and double-pole snap switches.
   3. Device wall plates.
   4. Special purpose receptacles.
   5. Floor service outlets,.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. PVC: Polyvinyl chloride.

C. RFI: Radio-frequency interference.

D. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
   1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Wiring Devices:
      a. Bryant Electric, Inc./Hubbell Subsidiary.
      b. Eagle Electric Manufacturing Co., Inc.
      c. Hubbell Incorporated; Wiring Device-Kellems.
      d. Leviton Mfg. Company Inc.
      e. Pass & Seymour/Legrand; Wiring Devices Div.
   2. Wiring Devices for Hazardous (Classified) Locations:
      a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
      b. EGS/Appleton Electric Company.
      c. Killark Electric Manufacturing Co./Hubbell Incorporated.

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
   1. Thermoplastic face.
   2. Thermoset base.
   3. Back and side wired.
   4. Rating: 20 A minimum

B. Straight-Blade (30 A thru 50A) and Locking Receptacles: Heavy -Duty grade.

C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

D. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

2.3 PENDANT CORD/CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle mounted at ceiling with external cable grip and spring tension device attached to SO Cord with duplex receptacle in nylon body as indicated in referenced detail.
   1. Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty.
   2. Straight-Blade Duplex receptacle (refer to previous specification) in Nylon body.
   3. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
   4. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.

2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
1. Rating: Minimum 20A.
2. Thermoplastic face.
3. Thermoset base.
4. Back and side wired.

2.6 WALL PLATES

A. Single and combination types to match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish, except screwless devices for locations where only dimmers are shown.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel .
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
5.

2.7 FINISHES

A. Color:
1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Install wall dimmers with capacity to achieve 60% of circuit loads indicated on drawings after derating for ganging according to manufacturer's written instructions.

C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

D. Install control wiring for electronic fluorescent dimmers (low voltage or line voltage) per manufacturers written instructions.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Wallplates and coverplates: install wallplates and coverplates for all outlets, including blank outlets.

G. GFI Devices: Install separate GFCI devices, except where installed under the same multi-gang plate.

H. Remove wall plates and protect devices and assemblies during painting.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

J. Install cord and plug sets for appliances, mechanical equipment, and other equipment per manufacturer’s written instructions.

3.2 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
   2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

END OF SECTION 16140

Standard Wiring Device Schedule

Note to Bidders: Comply with Section 16140 of the specifications. The catalog numbers listed below have been carefully prepared with the assistance of the manufacturer's representatives with the objective of assisting the bidders in determining the quality and ratings of the wiring device specified; however, the catalog numbers may not be complete or accurate. In addition, the color of the wiring device is not intended to be determined by the catalog numbers listed below, but shall be selected by the Architect as indicated in the specification. Each manufacturer prior to bidding shall compare catalog numbers shown with the description and shall notify the Architect/Engineer of any discrepancies.

NEMA	DESCRIPTION	CATALOG NUMBERS
NEMA 5-20R	20A, 125V 2 pole 3 wire duplex grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498.	Bryant 5352 Hubbell CR5352 Leviton 5352 P&S 5352
NEMA 5-20R GFCI	20A, 125V 2 pole 3 wire duplex feed thru GFCI receptacles with indicator light. Nylon or Lexan decorator faces. Back and side wired. Internal components shall comply with FS W-C-596 where applicable. Comply with UL 498 and UL 493.	Bryant GFR53FT Hubbell GF5352 Leviton 6898 P&S 2091 S
NEMA 5-20R Waterproof (Weatherproof in use) Coverplate	Cast aluminum and UL listed for wet locations, recessed box and surface box versions, for GFCI outlets.	Hubbell WP26 Hubbell WPFS26
NEMA 5-20R Weatherproof Coverplate	Cast aluminum and UL listed for wet locations for vertically mounted GFCI outlets.	Hubbell WP26M
20A Single Pole	20A single pole 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1221 Leviton 1221 P & S CSB120-XXX Bryant 4901
20A Three-way	20A three-way 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1223 Leviton 1223 P & S CSB320-XXX Bryant 4903
20A Four-way	20A four-way 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1224 Leviton 1224 P & S CSB420-XXX Bryant 4904
20A Double Pole	20A double pole 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 2 HP 240V. Double pole.	Hubbell CS1222 Leviton 1222 P & S CSB220-XXX Bryant 4902

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
   1. Motor and equipment disconnecting means.

B. Related Sections include the following:
   1. Division 16 Section "Fuses" for fusible devices.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPDT: Single pole, double throw.

D. MCP: Motor Circuit Protectors (Adjustable instantaneous trip circuit breakers).

1.4 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switch and circuit breaker.
   1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations and layout of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Current and voltage ratings.
      c. Short-circuit current rating.
      d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports and include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:
1. Routine maintenance requirements for components.
2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA AB 1 and NEMA KS 1.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2000 m).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Spares: For the following:
a. Fuses for Fused Switches: refer to Div 16 section “Fuses”.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fusible Switches:
a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Siemens Energy & Automation, Inc.
d. Square D Co.

2.2 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, built-in fuse pullers arranged to facilitate fuse removal, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.

2.4 FACTORY FINISHES

A. Finish: Manufacturer's standard gray paint applied to factory-assembled and -tested enclosures before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Equipment Disconnects
   1. Maximum elevation: 48”.
   2. Locate lockable disconnect near each motor complying with clearance requirements.
   3. Multiple speed motors: provide switch in all motor leads.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section " Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

C. Fusible Switch Labels: Label each enclosure with “REPLACE WITH CURRENT LIMITING FUSES ONLY. CATALOG NUMBER: (FUSE CAT. NO.).”

3.4 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
   2. Test continuity of each line- and load-side circuit.

B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16410

SECTION 16420 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ac general-purpose controllers rated 600 V and less that are supplied as enclosed units.

B. Related Sections include the following:
   1. Division 16 Section "Fuses" for fuses in fusible switches.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each enclosed controller.
   1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details.
      b. Nameplate legends.
      c. Short-circuit current rating of integrated unit.
      d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices in combination controllers.
   2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Field Test Reports: Written reports specified in Part 3.

D. Manufacturer's field service report.

E. Maintenance Data: For enclosed controllers and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:
   1. Routine maintenance requirements for enclosed controllers and all installed components.
   2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed controllers, including clearances between enclosed controllers, and for adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subjected to weather, cover enclosed controllers to protect from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect at least two days in advance of proposed utility interruptions. Identify extent and duration of utility interruptions.
2. Indicate method of providing temporary utilities.
3. Do not proceed with utility interruptions without Architect's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

D. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Spare Fuses: Furnish one spare for every five installed, but not less than one set of three of each type and rating.
2. Indicating Lights: Two of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Manual and Magnetic Enclosed Controllers:
      a. Eaton Corp.; Cutler-Hammer Products.
      b. General Electrical Distribution & Control.
      c. Rockwell Automation Allen-Bradley Co.; Industrial Control Group.
      d. Siemens/Furnas Controls.
      e. Square D Co.

2.2 MANUAL ENCLOSED CONTROLLERS

A. Description: NEMA ICS 2, general purpose, Class A, with toggle action and overload element.

2.3 MAGNETIC ENCLOSED CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.

B. Control Circuit: 120 V; obtained from integral control power transformer with a control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory-assembled combination controller and disconnect switch with safety interlock to prevent the door from opening when the unit is in operation.
   1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by a nationally recognized testing laboratory.

D. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 20 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.

2.4 ENCLOSURES

A. Description: Flush- or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.
   1. Outdoor Locations: NEMA 250, Type 3R.

2.5 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
   1. Pilot Lights: off indicating red lamp; on indicating green lamp; overload light: either separate light or both red and green lights illuminated. LED, 50,000 hours.

C. Auxiliary Contacts: Equip controllers with 2 N/O, 2 N/C auxiliary contacts.

D. Control Relays: Auxiliary and adjustable time-delay relays.

2.6 FACTORY FINISHES

A. Finish: Manufacturer's standard Grey paint applied to factory-assembled and -tested enclosed controllers before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Location: Locate controllers within sight of motors controlled, unless otherwise indicated.

3.2 APPLICATIONS

A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

3.3 INSTALLATION

A. See Division 16 Section "Basic Electrical Materials and Methods" for general installation requirements.

B. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 16 Section "Basic Electrical Materials and Methods."

C. Install freestanding equipment on concrete bases complying with Division 3 Section "Cast-in-Place Concrete."

D. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."

3.4 IDENTIFICATION

A. Identify enclosed controller components and control wiring according to Division 16 Section " Electrical Identification."

3.5 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers according to Division 16 Section "Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
   1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
   2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6 Provide relays and associated wiring required for sequence of operation.

3.7 CONNECTIONS

A. Conduit installation requirements are specified in other Division 16 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.8 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
1. Test insulation resistance for each enclosed controller bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.
3. Document that overload sizes or settings have been determined based upon actual motor nameplate information.

B. Testing: Perform the following field quality-control testing:
1. Perform each electrical test and visual and mechanical inspection indicated in NETA ATS, Sections 7.5, 7.6, and 7.16.
2. Certify compliance with test parameters.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Test Reports: Prepare a written report to record the following:
1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

3.9 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.10 CLEANING

A. Clean enclosed controllers internally, on completion of installation, according to manufacturer's written instructions. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 16420

SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
   1. Lighting and appliance branch-circuit panelboards.

B. Related Sections include the following:
   1. Division 16 Section "Fuses."

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
      a. Enclosure types and details for types other than NEMA 250, Type 1.
      b. Bus configuration, current, and voltage ratings.
      c. Short-circuit current rating of panelboards and overcurrent protective devices.
      d. Layout of overcurrent devices in panelboard.
      e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Field Test Reports: Submit written test reports and include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

A. Keys: Six spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Div.
c. Siemens Energy & Automation, Inc.
d. Square D Co.

2.2 FABRICATION AND FEATURES

A. Enclosures: Flush- and surface-mounted cabinets as indicated on the drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

B. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

C. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

D. Bus: Hard-drawn copper, 98 percent conductivity or Tin-plated aluminum.

E. Main and Neutral Lugs: Compression type suitable for use with conductor material.

F. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

G. Insulated Equipment Ground Bus: Adequate for feeder and branch-circuit equipment insulated ground conductors; insulate from box.

H. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

I. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

J. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: as indicated on drawings.

C. Branch overcurrent protective devices shall be one of the following:
1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.
2. GFCI Circuit Breakers: Single- and two-pole configurations with -mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

PART 3 - EXECUTION

3.1 APPLICATION

A. Examine areas where panelboards are planned to be installed. Coordinate with other installers so that installation complies with NEC 110-26.
1. Do not locate panelboards so that the door swing swings through the clear area.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."

C. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

D. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Circuit Directory: Create a directory to indicate installed circuit loads showing locations (final room numbers as determined by user) and use. Obtain approval for room numbers to be used before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
1. Existing Panelboards: verify existing circuits and create new circuit directory.

F. Install filler plates in unused spaces.

G. Provision for Future Circuits at Flush Panelboards: Stub six 1-inch (27-GRC) empty conduits from panelboard section into accessible ceiling space or space designated to be ceiling space in the future. Stub five 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

H. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section " Electrical Identification."

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16442

SECTION 16491 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes cartridge fuses, rated 600 V and less, for use in switches, panelboards, switchboards, controllers, and motor-control centers; and spare fuse cabinets.

1.3 SUBMITTALS

A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings for each fuse type indicated.

B. Product Data: Include the following for each fuse type indicated:
1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

C. Maintenance Data: For tripping devices to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (4.4 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged in original cartons or containers and identified with labels describing contents.
   1. Fuses: Quantity equal to 10 percent of each fuse type and size, but not fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Industries, Inc.; Bussmann Div.
   2. Gould Shawmut.
   3. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.3 SPARE FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: "SPARE FUSES" in 1-1/2-inch- (40-mm-) high letters on exterior of door.
   4. Fuse Pullers: For each size fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Refer to drawings for fuse types and sizes.
   1. Motor fuse sizes: Field select motor fuse sizes using the class of fuse shown on the drawings and sizing the fuse based upon the motor nameplate information and by multiplying by 1.25 (except for special service motors).

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare fuse cabinet.

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 16491

SECTION 16511 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Interior lighting fixtures with lamps and ballasts.
   2. Lighting fixtures mounted on exterior building surfaces.
   3. Emergency lighting units.
   4. Exit signs.

1.3 DEFINITIONS

A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

B. CRI: Color rendering index.

C. CU: Coefficient of utilization.

D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
   1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

E. RCR: Room cavity ratio.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of fixture, including dimensions and verification of indicated parameters.
   2. Emergency lighting unit battery and charger.
   3. Fluorescent and high-intensity-discharge ballasts.
   4. Lamps.

B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. Wiring Diagrams: Power, signal, and control wiring.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "," include the following:
   1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.

E. Warranties: Special warranties specified in this Section.

F. Spare Parts: include spare parts materials and quantity.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   1. Test products to UL standards by nationally recognized testing laboratory, where an appropriate standard exists.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

B. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
   2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

1. Equip recessed fixtures with six foot flexible conduit whips for connection to external j-boxes, except that junction boxes may integral for prewired framing kits for incandescent and PL fluorescent downlights.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
1. White Surfaces: 92 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

I. Plastic Diffusers, Covers, and Globes:
1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is scheduled.
   b. UV stabilized.
2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 LIGHTING FIXTURES

A. Fixtures: Refer to Lighting Fixture Schedule on the drawings.

2.4 FLUORESCENT LAMP BALLASTS

A. Description: Include the following features, unless otherwise indicated:
1. Designed for type and quantity of lamps indicated at full light output, unless 1.2 BF is specified.
   a. Linear Electronic Ballasts: full light output is defined as .88 BF.
   b. Linear Magnetic Ballasts: full light output is defined as .95 BF.
   c. Compact Fluorescent Ballasts: full light output is defined as 1.0 BF.
2. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

B. Electronic ballasts (nondimming) for linear lamps shall include the following features, unless otherwise indicated:
1. Comply with NEMA C82.11.

2. Ballast Type: Programmed start with two-step lamp starting to extend life of frequently started lamps; if not available from any manufacturer, provide rapid start.
3. Sound Rating: A.
4. Total harmonic distortion rating of less than percent according to NEMA C82.11.
5. Transient Voltage Protection: IEEE C62.41, Category A.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: Less than 1.7.
8. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

C. Ballasts for compact fluorescent lamps in recessed fixtures shall have the following features, unless otherwise indicated:
1. Type: Electronic.
2. Power Factor: 90 percent, minimum.
3. Flicker: Less than 5 percent.
4. Lamp Current Crest Factor: Less than 1.7.
5. Electronic Ballast Operating Frequency: 20 kHz or higher.
6. Lamp end-of-life detection and shutdown circuit.
7. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.

D. Ballasts for compact lamps in nonrecessed fixtures shall include the following features, unless otherwise indicated:
1. Power Factor: 90 percent, minimum.
2. Ballast Coil Temperature: 65 deg C, maximum.
3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.

E. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:
1. Dimming Range: 100 to 5 percent of rated lamp lumens, unless specifically indicated otherwise.
2. Ballast Input Watts: Can be reduced from 100 to 20 percent of normal as it dims.
3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.

F. Ballasts for Low-Temperature Environments:
1. Temperatures 0 deg F (Minus 17 deg C) and Higher: Electronic or electromagnetic type rated for 0 deg F (Minus 17 deg C) starting temperature.
2. Temperatures Minus 20 deg F (Minus 29 deg C) and Higher: Electromagnetic type designed for use with high-output lamps.

2.5 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated.
1. Type: Constant-wattage autotransformer, pulse start, or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 deg F40 deg C.
4. Open-circuit operation that will not reduce average life.

B. High-Pressure-Sodium Ballasts: Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.

2.6 EXIT SIGNS

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, nickel-metal hydride or Lithium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.7 FLUORESCENT EMERGENCY LIGHTING FIXTURES

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
1. Emergency Connection: Operate one fluorescent lamp continuously to 1100 lumens minimum. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
3. Battery: Sealed, maintenance-free, with minimum seven-year nominal life.
4. Charger: Fully automatic, solid-state, constant-current type.

2.8 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with Federal toxic characteristic leaching procedure (TCLP) test, and yield less than 0.2 mg of mercury per liter, when tested according to NEMA LL 1.

B. T8 rapid-start low-mercury lamps, CRI of 82 (minimum), color temperature of 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

C. T5 programmed-start low-mercury lamps, CRI of 85 (minimum), color temperature of K, and average rated life of 20,000 hours, unless otherwise indicated.

D. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

2.9 HIGH-INTENSITY-DISCHARGE LAMPS

A. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature.

2.10 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage (2.68 mm).

D. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.

2.11 FINISHES

A. Fixtures: Manufacturers' standard, unless otherwise indicated.
1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

2.12 SOURCE QUALITY CONTROL

A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Adjust trims for recessed fixtures to eliminate light leaks. Install lamps in each fixture.
1. Install fixtures with the separation from combustible material as required by lighting fixture rating, per manufacturer’s written instructions; in no case, install recessed fixture within ½” of combustible material.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel or at the intersection of four tiles, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Fixture Support: As follows:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

D. Adjust aimable fixtures to provide required light intensities.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
   1. Clean transparent materials. Replace chipped or broken lenses and other damaged transparent materials.
   2. Restore reflective surfaces to their reflective conditions.
   3. Clean light fixtures and lamps.

B. Verify normal operation of each fixture after installation.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

D. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 16511

SECTION 16860 - FIRE ALARM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. General: Connection to an existing system for new remodel area initiating and indicating devices.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

E. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.

F. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

G. Certificate of Completion: Comply with NFPA 72.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

E. Comply with NFPA 72.

1.7 SEQUENCING AND SCHEDULING

A. Existing Fire Alarm Equipment: Maintain fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of the new fire alarm system, remove existing disconnected fire alarm equipment and restore damaged surfaces.
   1. Package operational fire alarm and detection equipment that has been removed and deliver to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Match existing Simplex system

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of System: By the FACP.

B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

D. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.

E. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.

F. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.

G. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when a single ground or open circuit occurs in an initiating device circuit, signal line circuit, or notification-appliance circuit.

H. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

I. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of initiating device initiates the sequence of operation as indicated in the fire alarm matrix.

J. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP and the remote annunciator.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

K. Water-flow alarm switch operation initiates the following:
1. Notification-appliance operation.
2. Flashing of the device location-indicating light for the device that has operated.

L. Operating a heat detector in the elevator shaft shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.
1. A field-mounted relay actuated by the fire detector or the FACP closes the shunt trip circuit and operates building notification appliances and annunciator.

M. Sprinkler valve-tamper switch operation initiates the following:
1. A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event by the system printer.
4. Transmission of supervisory signal to remote alarm receiving station.

N. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system initiates the following:
1. A supervisory, audible, and visible "sprinkler trouble" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event by the system printer.
4. Transmission of trouble signal to remote central station.

O. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. Same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity-adjustment schedule changes are recorded in system memory and are printed out by the system printer.

P. Removal of an alarm-initiating device or a notification appliance initiates the following:
   1. A "trouble" signal indication at the FACP and the annunciator for the device or zone involved.
   2. Recording of the event by the system printer.
   3. Transmission of trouble signal to remote alarm receiving station.

Q. Printout of Events: On receipt of the signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printout of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

R. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.3 MANUAL PULL STATIONS

A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.

   1. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm.
   2. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
   3. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

2.4 SMOKE DETECTORS

A. General: Include the following features:
   1. Operating Voltage: 24-V dc, nominal.
   2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
   4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
   5. Sensitivity: Can be tested and adjusted in-place after installation.
   6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   7. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

B. Photoelectric Smoke Detectors: Include the following features:
   1. Sensor: LED or infrared light source with matching silicon-cell receiver.
   2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

C. Beam-Type Smoke Detector: Each detector consists of a separate transmitter and receiver with the following features:
   1. Adjustable Sensitivity: More than a six-level range, minimum.

2. Linear Range of Coverage: 600 feet (180 m), minimum.
3. Tamper Switch: Initiates trouble signal at the central FACP when either transmitter or receiver is disturbed.
4. Separate Color-Coded LEDs: Indicate normal, alarm, and trouble status. Any detector trouble, including power loss, is reported to the central FACP as a composite "trouble" signal.

D. Duct Smoke Detector: Photoelectric type.
1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied.

2.5 OTHER DETECTORS

A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate of rise of temperature that exceeds 15 deg F (8.3 deg C) per minute, unless otherwise indicated.
1. Mounting: Plug-in base, interchangeable with smoke detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).
1. Mounting: Plug-in base, interchangeable with smoke detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.

B. Wall-Mounted Smoke Detectors: At least 4 inches (100 mm), but not more than 12 inches (300 mm), below the ceiling.

C. Smoke Detectors near Air Registers: Install no closer than 60 inches (1520 mm).

D. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

E. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.
1. Synchronization: synchronize any two strobes located such that they are visible from the same location.

3.2 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated.

B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as

recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."
   1. Paint all fire alarm system junction boxes, device boxes and pull boxes with red paint.

B. Install instructions frame in a location visible from the FACP.

C. Prepare laminated drawings showing each device and identifying the device address or zone

3.4 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 16 Section "Grounding."

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
   1. Verify the absence of unwanted voltages between circuit conductors and ground.
   2. Test all conductors for short circuits using an insulation-testing device.
   3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
   4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
   5. Test initiating and indicating circuits for proper signal transmission under open circuit and ground fault conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
   6. Test each initiating and indicating device for alarm operation and proper response at the control unit.
      a. Test smoke detectors with actual products of combustion.
      b. Test each heat detector with hair dryer or other means approved by the manufacturer.
      c. Test fan shut down, sprinkler flow and tamper switches, door closers, magnetic door holders, and elevator return.
   7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
   8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
      a. Disconnect fire alarm from primary power source 24 hours prior to test, or longer as specified. Test all indicating devices to determine whether audio and visual devices comply with testing requirements for a 15 minute test.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.6 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
   1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.
   2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.8 ON-SITE ASSISTANCE

A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION 16860